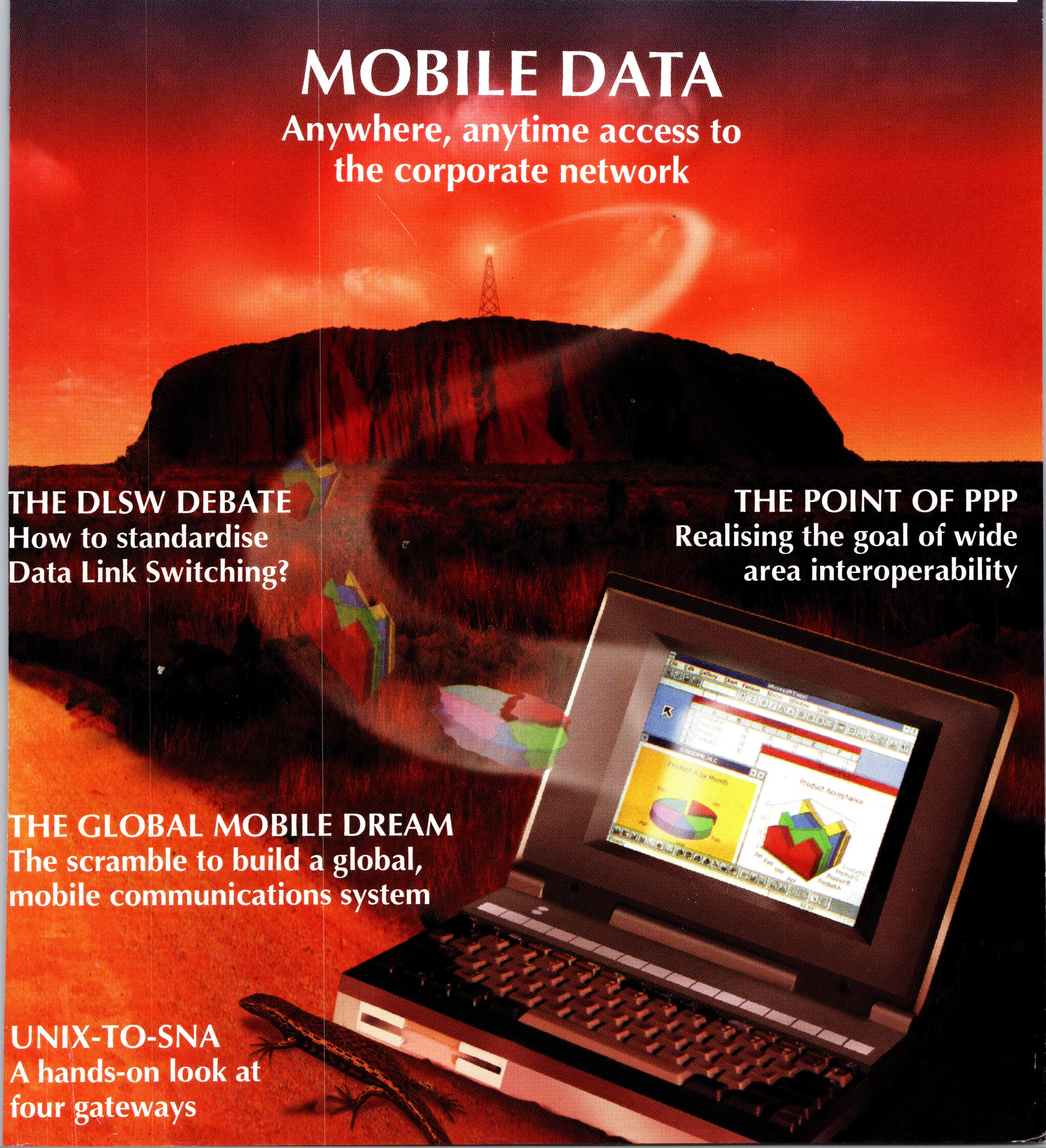
AUSTRALIAN communications

JULY 1994 The Networking and Telecommunications Management Magazine $5.50



MOBILE DATA

Anywhere, anytime access to the corporate network

THE DLSW DEBATE

How to standardise Data Link Switching?

THE POINT OF PPP

Realising the goal of wide area interoperability

THE GLOBAL MOBILE DREAM

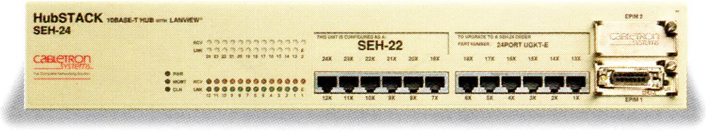
The scramble to build a global, mobile communications system

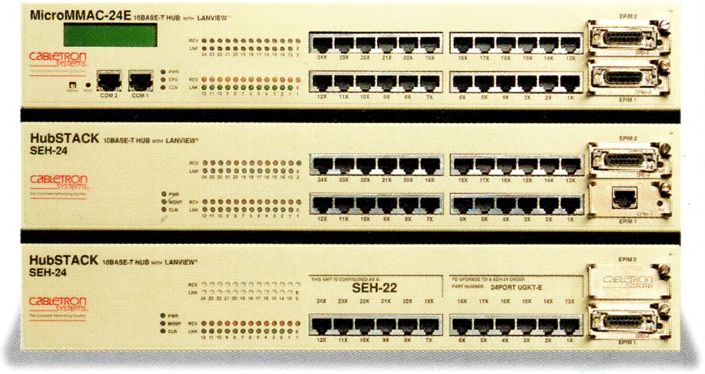
UNIX-TO-SNA

A hands-on look at four gateways

GROWTH

CABLETRON SYSTEMS: THE COMPLETE




MicroMMAC-24E 10BASE-T HUB with LANVIEW
HubSTACK 10BASE-T HUB with LANVIEW
SEH-24
HubSTACK 10BASE-T HUB with LANVIEW
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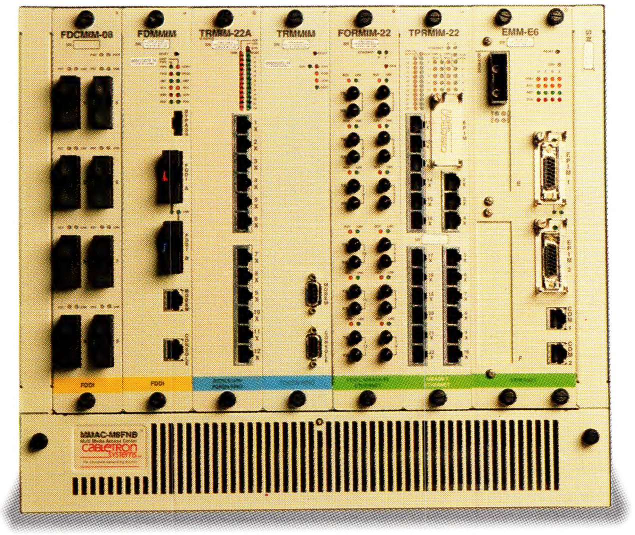
POTENTIAL

SOLUTION FOR EVOLVING NETWORKS



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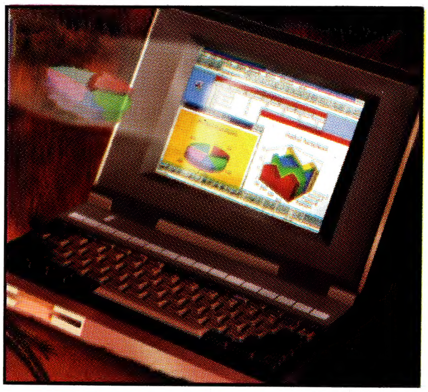
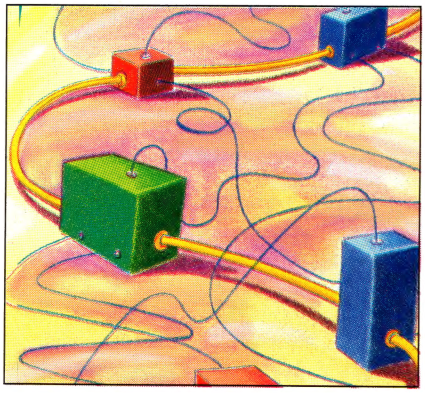


Cover: Eye For Design



MOBILE DATA 59

Until recently, wide area wireless data networking has been available to only a few hardy souls who dared to cut the cable and use wireless for faxes, electronic mail and file transfers. But, due to advances in technology, availability and cost, wireless mobile data is now attracting far more interest. Radio modems are now the size of a small mobile phone and will shortly be available as PCMCIA cards, and some equipment has in-built modems. The effect of this technology change is that users can be equipped with truly portable and usable equipment for a few thousand dollars. As a consequence, Australia now has two public mobile data networks open for business, where before it had none.

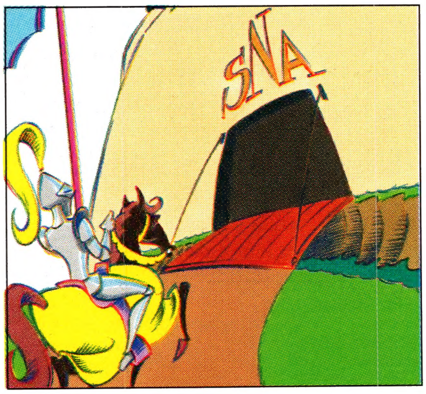
GLOBAL, MOBILE COMMUNICATIONS 69

Two years ago we looked at the race to produce the first global mobile communications system. What has changed in the interim? Not much, actually. As Stewart Fist reports, some new concepts have been and gone but the main players are still there. Among new schemes which seem to have real potential is a data-only 'Little LEO' project called Orbcomm. This proposal could be the first of the bunch to have real electronics in orbit. At the other end of the scale, there's Teledesic, the new scheme from Bill Gates and McCaw Cellular's Craig McCaw that's just been announced and seems to be rather ephemeral.

THE POINT-TO-POINT PROTOCOL 81

The encapsulation techniques that bridge and router vendors use to send traffic over wide area links represent one of the last bastions of proprietary technology in the internetworking world — as well as one the last obstacles to interoperability. No matter how many LAN protocols two given devices have in common, if they don't use the same WAN protocol they simply won't be able to work together. The new point-to-point protocol is aimed squarely at eliminating this problem and recent testing of PPP-compliant routers shows that vendors are getting closer to offering any-to-any protocol connectivity over the wide area.

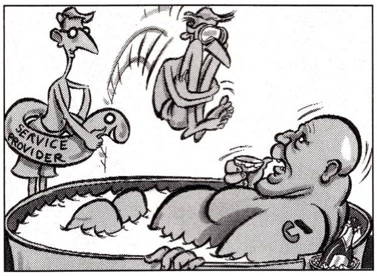
JULY 1994



UNIX-SNA GATEWAYS 89

The backbone protocol debate rages on: IBM SNA champions say recent developments in APPN ensure SNA's dominance for years to come, while TCP/IP's backers counter that multi-threading and multitasking make Unix ideal for multi-platform networks. But these days the key to corporate survival is coexistence. This test of gateway products from Brixton Systems, Hewlett-Packard, IBM and Unisys shows that it's a snap to combine SNA and Unix, but that wide variations in the quality and quantity of SNA services exist. The products ranged from offering full-featured SNA implementations to requiring all transactions to make calls to TCP/IP sockets.

ANALYSIS



13 The End of Telstra's SPA Party
Telstra's Flexi-Plans and SPAs are no more. Are service providers now more likely to get a better deal?

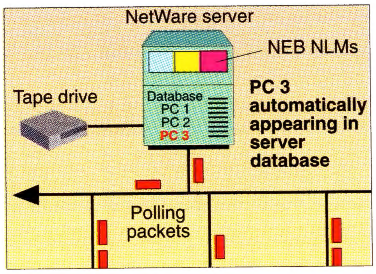
14 Stock Watch
15 Optus Gets Out on the Highway
16 NetComm Under Siege?
18 The Fast Demise of Fastpac?
20 Telstra Joins WorldPartners
21 New Zealand's Dividend Debacle

TECHNOLOGY

23 Just What is DLSw?
DLSw has come to mean different things to different vendors as proprietary extensions begin to hamper standardisation attempts.

24 Market Watch
26 ISDN Freedom at Last
28 The Client/Server Challenge
33 Technology Update
34 AT&T's Novell Network Nexus
37 Software Views — James Rafferty
38 LAN Views — Graeme Le Roux
41 Open Systems — Alan Lloyd

PRODUCT LEADERS



45 Digital's Bandwidth Buster
The GIGAswitch is as fast as they come, robust, unable to be overloaded, and will never drop valid packets.

46 Backing-Up the Enterprise
Symantec's new Norton Enterprise Backup saves data from multiple LANs to multiple tape drives.

47 HP Enters the 100Mbps Stakes
Hewlett-Packard unveils the industry's first 100VG-AnyLAN product line. It works, but will it sell?

OPINION

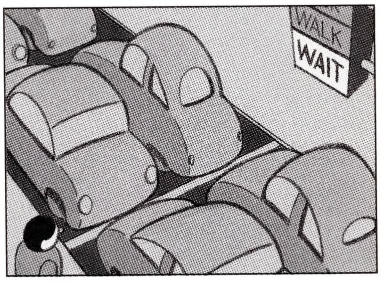
56 Tom Amos questions the legitimacy of Telecom's price rise plans in the light of its continuing heavy losses in overseas ventures.

57 John Craven of Andersen Consulting discusses the best ways for local industry to approach the fast growing Chinese marketplace.

INTERVIEW

49 Jean-Paul Schittenhelm
As Regional Vice President, Australasia and South Pacific, of the Société Internationale de Télécommunications Aéronautiques (SITA), Jean-Paul Schittenhelm helps to run what is now the largest private data network in the world.

LEGAL LINE



53 Rights Turn on the Infobahn
The Copyright Convergence Group is about to report on possible reforms to the *Copyright Act* to deal with emerging delivery technologies. What are the problems which require urgent resolution?

DEPARTMENTS

VIEWPOINT	6
UPDATE	8
PRODUCT FILE	99
THE ATUG PAGES	109
CALENDAR	114

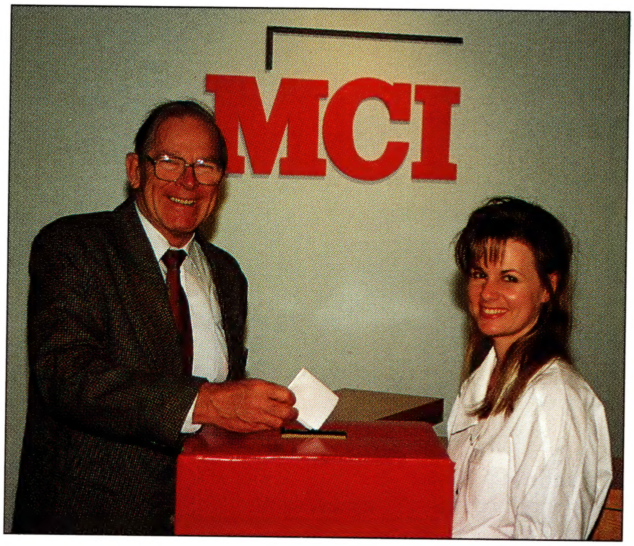
At Last, the Mobile Office?

For some time now, wireless data networking has almost been a technology in search of a user. While vendors have been beating the drum about the portable workplace for years, for most of us it's been little more than a pipedream due to high equipment costs, interoperability fears and hard to use products. Thankfully, that is all finally changing — the advent of PCMCIA cards, PDAs and miniature radio modems has meant truly portable and usable equipment is finally coming onto the market at an affordable price. To capitalise on the expected boom in mobile computing, Australia now has two new public mobile data networks, BellSouth Mobile Data and Telecom MobileData. Our cover story this month looks at these networks and the other options available, to determine how users can get the most out of wireless computing without breaking the bank.

A related story by Stewart Fist starting on page 69 provides an overview of the plethora of global mobile communications schemes currently on the drawing board. While the Gates/McCaw proposal for a $US12 billion 840-satellite supernetwork may have been grabbing all the headlines, it seems likely that some of the more modest 'little LEO' projects have more real chance of success, at least in the short term.

Interoperability never ceases to be a burning question for network managers, so our other two features this month both focus on connectivity issues. The point-to-point protocol has been developed to solve interoperability problems in the wide area, but how well does it work in real-life products? We look at the latest tests of PPP-compliant routers, and find that any-to-any connectivity is becoming a reality. The ability to mix mainframe data with data from other systems is also paramount in today's mixed network environment. The Data Comm Test Lab's study of Unix-to-SNA gateways starting on page 89 shows that the leading products in the field all have the ability — albeit by using different approaches — to deftly combine Unix and SNA without a glitch.

S E Parkes



Hawaiian Holiday Winner Drawn

June 1 saw the draw of the winning entry for our subscription competition, in which readers were given the chance to win a Hawaiian holiday for two flying Qantas Business Class and staying for five nights at the beautiful Sheraton Waikiki Hotel. Also included with the main prize was an MCI Calling Card valued at $100. The winner of the competition was Mr G. Martin of Corrimal in NSW.

Mr Martin's entry was drawn from the box at MCI International (Australia) headquarters in Pymble, NSW, by Australian General Manager, Mr Ron Flood, assisted by *Australian Communications'* Deputy Advertising Manager Dawn Switzer.

AUSTRALIAN
communications

EDITOR
Mark Smeaton

CONTRIBUTORS
Tom Amos, Stewart Fist, Liz Fell,
Peter Leonard, Peter Waters,
Stuart Corner, Graeme Le Roux,
Bill Bennett, Bernard Levy,
Alan Lloyd, Peter Purton

ASSISTANT EDITOR
Sarah Parkes

PRODUCTION MANAGER
Elisabeth Alexander

ILLUSTRATIONS
Raphaella La Roche, Aldo Venturi
Loui Silvestro

SALES AND MARKETING DIRECTOR
Craig Burkill

DEPUTY ADVERTISING MANAGER
Dawn Switzer

CHIEF FINANCIAL OFFICER
Jennifer Stibbard

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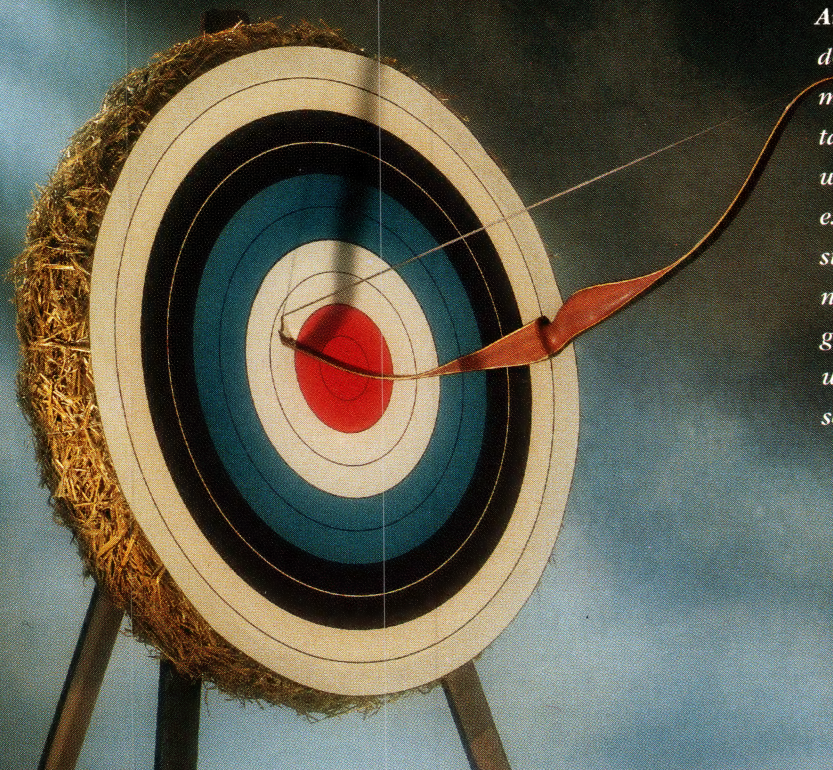

The solution is to work with a company that knows how to take your equipment and make it work for you. A company that knows what's ahead so you won't get left behind. A company that understands how to build a network with the latest routers, hubs and structured cabling systems that will grow with you. Today, the question isn't just about equipment. But who can you trust with the know-how to bring everything in your network together?

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Post-1997 Policy Review Announced

Communications Minister Michael Lee has announced that a review of the post-1997 telecommunications policy and regulatory arrangements will commence shortly.

The review will consider a number of issues, including: the relevance of the current carrier licensing scheme; the types of new carriers to licensed; the future of price regulation; Austel's role; and consumer and social issues such as universal service, numbering policy and industry development. It will be conducted with the assistance of an advisory panel drawn from industry and consumer groups and chaired by the Minister.

Michael Lee

According to Mr Lee "The review will need to re-examine some of the concepts underlying the current *Telecommunications Act*. These include the basis for existing carrier reservations, the distinction between basic carriage services and higher level services, dominance, discrimination, and the 'standard telephone service' concept."

He said that it "reflects the Government's commitment to the sunset date of 30 June 1997 on the duopoly, leading to full and open competition." He foreshadowed that the Government would consider the results of the review after the 1995-96 Budget with a view to introducing relevant legislative changes later in 1995. These changes will provide a firm basis for commercial planning, he said.

Optus Wins 13% Ballot Share

The preselection ballot process has so far yielded Optus around 13% of the long distance call market, according to figures recently released by Austel.

Optus has won 12% of long distance lines in Canberra, 18% in Sydney, 14% in Melbourne, 10% each in Mornington and Geelong, and 14% in the most recent vote in South East Queensland. Optus CEO Bob Mansfield said, however, that Optus's own market research shows that those who voted in the ballot tend to be people who make more long distance calls than average. Because of this, he said the company's share of long distance traffic would be higher than indicated simply by the percentage of Optus customers.

Austel Chief Operating Officer, Rick Campbell, said the ballot process has been an outstanding success, giving both carriers the opportunity to win customers. Optus commenced its 'dial 1' service to North East Queensland early this month.

THE PRESELECTION BALLOT

REGION	RESPONSE RATE	OPTUS SHARE	TELECOM SHARE
Sydney (02)	58%	18%	82%
Melbourne (03)	56%	14%	86%
Canberra (06)	52%	12%	88%
Mornington (059)	50%	10%	90%
Geelong (052)	55%	10%	90%
SE Qld (07), (075), (074)	53%	14%	86%

Source: Austel

AT&T Signs FTA; Sells GSM to Optus

AT&T's drive to consolidate its presence in Australia reached a new plateau last month when the company signed a $104 million Fixed Term Arrangement (FTA) with the Federal Government only a few weeks after sealing a deal to supply Optus with GSM switching equipment.

The FTA agreement is the largest signed since the programme commenced and outlines $74 million in exports over a four-year term. It will be built around three strategic areas: investment in export-oriented manufacturing infrastructure; investment in an R&D facility; and continued partnership with Australian firms.

The R&D centre will be based in Sydney, initially employing 10 staff and concentrating on software design for products such as the company's Definity multimedia switch. The manufacturing component of the agreement will be fulfilled by a new $20 million Systimax cable production facility, announced earlier this year.

The details of AT&T's GSM deal with Optus are commercial in confidence, although Optus has stressed that its relationship with its primary GSM switch supplier, Nortel, remains strong. AT&T's 5ESS switch will form the basis of what Optus calls its second phase GSM rollout.

JNA's Telecom, StrataCom Deals

JNA has signed a number of key deals strengthening its position as an important supplier and integrator of telecommunications equipment.

Topping the list is a 5-year $50 million Product Sourcing Agreement (PSA) with Telecom which covers a range of equipment and technologies, including the company's Unimux systems for Telecom's DDS service, FlexNet multiplexers, CPE and cross connect systems.

JNA has also won a significant export contract worth $2.4 million to supply, in conjunction with its Thai partner Jasmine, cross connect switches, network terminating units, multiplexers and other equipment to Thai Telephone & Telecommunications. The equipment will be used to build and operate a network in provincial Thailand.

Early last month, JNA also tied up a deal with US switch maker StrataCom to distribute the company's frame relay and cell switching products in Australia and throughout Asia. The deal may eventually lead to joint JNA-StrataCom product integration and development.

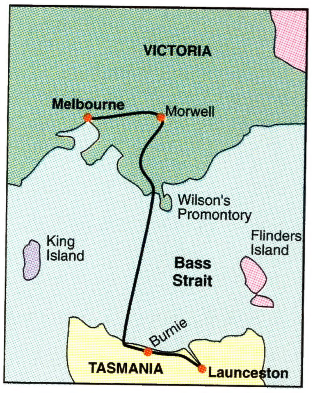
Additionally, the company has recently lifted its stake in WA-based network integrator Netsource from 50% to 100%.

Fibre Link For Tasmania

Telecom has announced a $30 million project to link Tasmania to the rest of Australia via optical fibre cable.

Work on the new Hobart-Launceston-Melbourne cable will begin this month, with service on the new route expected to begin next year. The cable will run underwater for 240 kilometres from Boat Harbour, near Burnie in Tasmania, to land near Wilson's Promontory in Victoria. The State's first mainland cable link was laid in 1859.

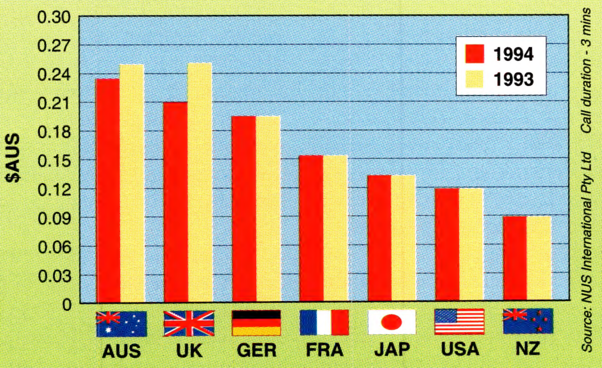
Announcing the project in Hobart, CEO Frank Blount said Telecom would also embark on a $286 million investment program to digitise every Tasmanian phone service, and give Tasmanian customers access to new intelligent network services.



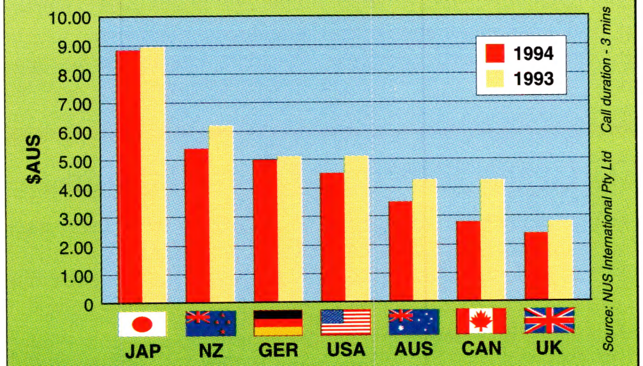
CALL COSTS COMPARED

NUS International's annual survey of world call costs reveals Australia as the most expensive country among those surveyed in which to make a 3-minute local call. Canada, which offers free residential and business calls (residential, but not business calls are free in New Zealand) couldn't be beaten at the other end of the scale. Australia fared better in the trunk telephone call (320km for 3 minutes) comparison where it finished around the middle of the field with a charge of $0.96, compared to $2.38 in Japan, the most expensive nation. The countries included in the NUS survey were: Australia, UK, Belgium, Germany, Italy, France, Japan, USA, The Netherlands, New Zealand, Sweden and Canada.

Local Calls



International Calls



NOTES: International calls are based on a trans-Pacific or trans-Atlantic distance as appropriate for the country. Where more than one carrier exists (for example Telecom and Optus), averages have been used. Available discounts have been applied in some cases.

Thomson Supplies Our Asian Voice

Australia's voice in Asia is now louder and clearer following the commissioning of Radio Australia's new Thomcast-supplied 250kW short wave transmitter at Darwin's Cox Peninsula.

Selected by Telecom in 1991, the Thomcast (a fully-owned subsidiary of Thomson-CSF) TRE 2326 transmitter is a state-of-the-art single tube system which has several key advantages over the old Collins model, which has been in place since the Cyclone Tracy disaster. According to Thomcast it features three key developments in short wave technology: a compact solid state modulator, a world-first fully solid state RF drive chain up to a single tube output stage, and a high-efficiency, low stress RF power stage using the firm's extra-large TH 558 tube.

The new $9 million Darwin transmitter broadcasts news, current affairs, sport and light entertainment programs in eight languages to an estimated 50 million listeners in South East Asia. Senator Bob Collins, Minister for Primary Industries and Energy, officially commissioned the new unit by typing the word 'Bob' into the system's management console.

In Brief

Robin Davey, formerly Chairman of Austel, has been appointed as Victoria's Regulator-General. Davey will oversee the privatisation of a range of Victorian industries including electricity, gas, ports, grain handling and water. Neil Tuckwell has been appointed acting Austel Chairman until Davey's successor is selected.

Intel has signed a Memorandum of Understanding with Telecom Australia to undertake the joint development of desktop videoconferencing applications which can be accessed via modems, LANs, the PSTN and the ISDN.

Alcatel has completed a major staff recruitment program to expand its System 12 digital exchange R&D groups, which work on the development of sophisticated switching software. The company says it has added more than 100 engineers and other staff to the already 300-strong engineering team.

Brisbane City Council will use Telstra's Fleetcoms Trunked Mobile Radio network for its new mobile radio communications service, dubbed CityCall. The system will service a 2,000-plus fleet of vehicles, and will also be used by Council staff on foot.

Scitec has won an order worth $1.3 million from Telecom for its Australian-designed and manufactured SAT2001 network interface adaptors. The equipment will be used in Telecom's internal Corporate Data Network to interface between network routers and the company's Megalink 2Mbps leased lines.

The CWU has initiated proceedings against Optus in the Industrial Relations Commission after the company's recent moves to replace its industrial agreement with the union with a new 'enterprise flexibility agreement' negotiated directly with employees. The CWU claims Optus is not providing union representatives with full access to employees.

GEC Alsthom IT has announced a 23% increase in revenue after its first full year of operation as an integrated business. The company, which was formed from the merger of all GEC Alsthom-owned computer businesses early last year, generated revenues of $33 million for the full year period to 31 March.

Austel has announced that all Melbourne telephone numbers will change on 8 May 1995, in the first phase of the Australia-wide renumbering programme. From May next year, all existing phone numbers in Melbourne will have '9' added at the beginning.

Kalpana, a leading US vendor of Ethernet switching products, has appointed Anixter as its Australian distributor.

PictureTel Corporation, a US-based supplier of videoconferencing systems, has set up an Australian subsidiary, to be based in Glebe, NSW. The Australian Managing Director is Geoff Ward.

Stanilite has signed a Memorandum of Understanding with one of China's largest engineering companies, China Systems Engineering Electronics Corporation (CESEC). The MoU covers the provision of system design, installation and servicing support by CESEC for all Stanilite equipment sold in China.

Vodafone has added Myline to its coterie of Service Providers, which already includes Australian Digital Services, FonePlus, Kerfone, Mobile Innovations, Smartcom and Vodac.

Hewlett-Packard has cancelled plans to move to a salubrious new corporate headquarters in Melbourne's Burwood. HP said it would now concentrate on refurbishing its existing site and would lease extra space to alleviate overcrowding.

Datacraft and AT&T Global Information Solutions have both been awarded Southern Cross Productivity Awards for Excellence by the Technology in Government committee, in association with the Department of Industry, Science and Technology.

CSC Australia, Datacraft, Com Tech, Telecom and Smithelec will work together on a $2.5 million contract to install two Base Area Networks for the Royal Australian Navy in Sydney. The two networks will eventually connect several LANs to the Navy's WAN.

Novell has joined the Government's Fixed Term Arrangement (FTA) programme, and says it now plans to undertake industry development activities worth over $60 million.

Telstra has won a contract to design, install and commission a HF radio broadcast transmitter system in Laos. The 50kW vertical incidence system will provide a domestic short wave signal.

In Brief

Nokia has entered into a strategic partnership with UK-based Nynex CableComms for the supply of telecommunications infrastructure expected to be worth over £100 million over the next five years. Nynex CableComms is the agent of associated companies that hold 17 franchise licences in the United Kingdom, encompassing more than 2.5 million households.

The ITU has outlined a series of proposals for the coming decade. New strategies have been put forward in several key areas, including radiocommunications, standardisation and development. The proposals will now go before the organisation's Plenipotentiary Conference, to be held in Kyoto in October.

Ericsson has notched up several new mobile communications sales successes in China. The company is to provide a digital/analogue AMPS system for the country's Nanjing region; equipment for the expansion of Shanghai's ETACS network; and TACS equipment for network expansion in Hebei.

UK cable operator Eurobell has been awarded a 15-year Local Delivery Operators Licence for west Kent. The licence, which Eurobell says is the first won by a UK operator, enables the company to provide advanced telecommunications and entertainment services using 40GHz and 17GHz MVDS technology.

Britain's phone bills are apparently the lowest in Europe, according to a study undertaken by telecommunications consultancy Analysys. The study claims UK call charges have been the lowest in the region since 1983, and also says the cost of a telephone service, including call charges and line rental, is lower in Britain.

The Bahamas is the first member of the Caribbean Community to join Inmarsat, bringing the number of member nations to 74.

BT's financial results for the year ending March 31 indicated a pre-tax profit rise of 2.8% compared with last year's result, to £2,756 million. Turnover rose by 3.3% to £13,675 million. The company said its profits had been reduced by as much as £500 million due to the cost of redundancies.

Memorex Telex has reported its financial results for the year ending 31 March. Total revenue for the year was $US1.015 billion, while net income was $US227 million. The company has undergone a major restructuring recently, and officials said financial comparisons with previous years are not meaningful.

Hughes has signed a multi-million dollar deal with Binariang Sdn Bhd to construct the Malaysia East Asia Satellite (MEASAT). Hughes will provide one HS 376 model spacecraft with a 12-year lifespan ready for launch late next year. There is also an option for a second, almost identical satellite.

BT says a recent independent survey shows that 82% of residential customers and 77% of business customers are satisfied with its services. An average 95% gave the company good marks for call quality, and 95% of calls were successful first time. At any one time at least 96% of payphones were operational, and 98% of private installations were completed by the date agreed.

Novell has reported a 45% boost in net revenue to $US407 million for its second quarter ended April 30. Net income for the quarter was $US105 million, an increase of 30%. For the first half of fiscal 1994, Novell's revenues were up 33% to $US718 million.

Cisco Systems' results for its third quarter ending May 1 show an increase in net income of 82% to $US84.3 million. Net sales for the period were $US331.2 million, a rise of 92%.

Ungermann-Bass unveiled a new corporate identity at NetWorld + InterOp in Berlin, and is now to be known as UB Networks. The company returned to profitability for its second quarter 1994, and has recently signed R&D agreements with Fujitsu and Newbridge.

Netway, Telecom New Zealand's value added services arm, has signed a deal with AT&T Easylink Services to become a member of that company's Global Alliance Program. Under the agreement, Netway will provide its customers with a range of electronic messaging services, including AT&T Mail and AT&T EDI.

Ericsson has won a contract to supply an AMPS mobile cellular network for the city of Moscow. The system, commissioned by VimpelCom, will initially support 10,000 subscribers, and is able to simultaneously provide a Digital AMPS service.

Sprint Signs with European Carriers

France Telecom and Germany's Deutsche Bundespost Telekom (DBT) have announced the signing of a Memorandum of Understanding with Sprint, the third largest carrier in the US, to create a global partnership for the provision of international telecommunications services.

The deal comes after prolonged speculation that the two European carriers, which announced an alliance late last year, were looking for a US partner. The new partnership will provide France Telecom and DBT with a ready-made global data network and virtual private network, and will give them a foot in the door to the UK public telecoms market.

The services planned by the trio include global international voice, data and video business services for both large and small customers; international services for consumers, initially based on card services for travellers; and 'carriers' carrier' services which will provide international transport for other carriers.

As part of the agreement DBT and France Telecom will become shareholders in Sprint, investing around $US4.2 billion over the next two years, to eventually hold a 20% equity stake in the company.

Sprint's existing global data network already has nodes in many major European cities, and the company also operates networks in Russia, Poland and Romania. The company also operates a global virtual private network in conjunction with Teleglobe, Hongkong Telecom, Mercury, Unitel, Unisource and Telstra.

Earlier this year, Sprint became the first US carrier to be awarded a Public Telecoms Operator licence in the UK, which allows it to offer all the services currently offered by BT and Mercury. It also plans international simple resale services in Australia, Canada and Sweden.

EU Urges Telecoms Liberalisation

The European Union's competition commissioner, Karel Van Miert, says Europe should push ahead with the rapid liberalisation of telecommunications services over television networks.

Van Miert said the liberalisation should not extend to public voice telephony services, but should involve niche services not currently offered by telecommunications operators.

He said the central issue of liberalisation debate was whether the freeing up of the market would undermine the ability of incumbent telecommunications providers to deliver universal service.

He said he was convinced that this would not be the case, and cited the UK experience where the ability of cable operators to provide local telephone links has led to cheaper calls and greater penetration of telecommunications services into previously unserviced areas.

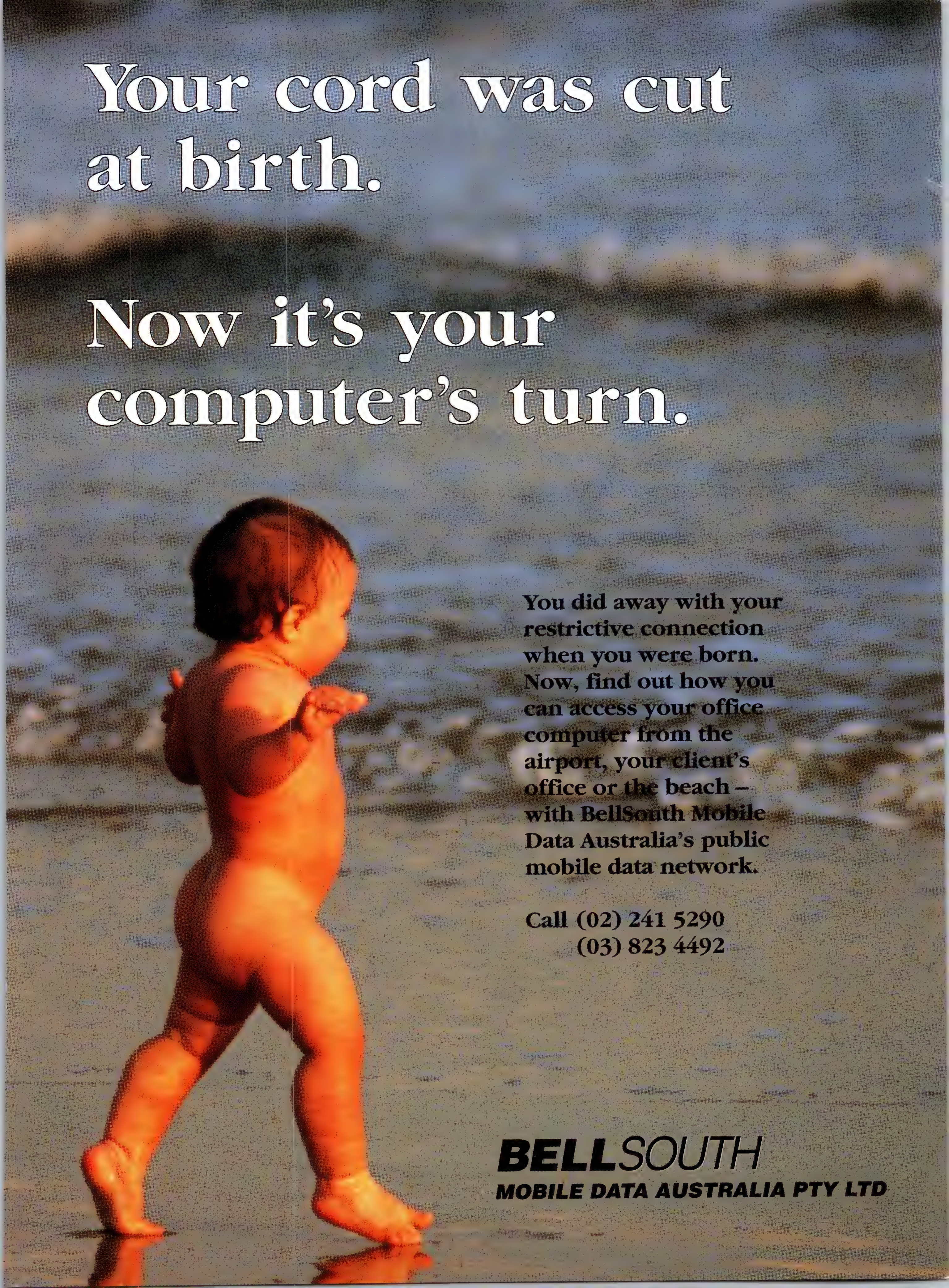
Mercury Says One-2-One is Booming

UK personal communications network operator Mercury One-2-One has laid to rest speculation about the real size of its subscriber base, with the announcement that it will shortly sign its 100,000 subscriber.

The company, which has a catchment area of London and south east England, says it now holds about 3% of the national UK mobiles market.

Meanwhile, Nortel has announced it has been awarded the contract to supply the network infrastructure equipment for the second phase of the Mercury One-2-One network.

The ten-year supply agreement is worth almost $US100 million, and includes GSM switching and base station technology and Nortel's new UK-developed smart antenna technology.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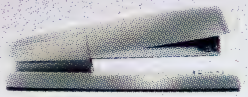

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The End of Telstra's SPA Party

Telstra's Strategic Partnership Agreements and Flexi-Plans are no more. Will service providers now get a better deal?

Much of Telstra's middle management may grimace at the thought, but like it or not, the day of the service provider is nigh. Few events illustrate the point better than Telstra's decision to drop its Strategic Partnership Agreements (SPAs) with large corporate and government customers — a move which signifies far more than simply loosening its grip on the most lucrative sector of the direct-line telecommunications market.

Spurred into action by a legal challenge from Optus, and advice from its own counsel that the SPAs and Flexi-Plans may be questionable in law, the former monopolist's climb-down demonstrates its powerlessness to oppose the spirit of the Government's original intention to free up the market.

Jostling in the wings for a bigger slice of the action, alongside Optus and Vodafone, are the major service providers, such as AAP Telecommunications, Pacific Star, Axicord, BT Australasia, Call Australia, Network Exchange and others, as well as 130-plus smaller players in Pay TV, information services, 0055 services and broadband services. All come under the wing of industry lobby group, the Service Providers Action Network (SPAN) and subsidiary groupings such as the Telephone Service Providers Association of Australia (TELSPAA) and the Australian Teleconferencing Association (ATA).

Their future prospects will be influenced in large measure by the outcome of Austel's second, more comprehensive, review of the resale and service provision sector, commenced last month after the release of a preliminary paper requesting industry and public input. Due to be completed by the end of the year, the review's recommendations in turn hinge on Austel's attempts to put together a decision-making framework, known as the DMF, by next month.

The aim is to give Austel a strong, but flexible, mechanism for making rulings on tariffs, such as the SPAs and Flexi-Plans, under the *Telecommunications Act* amendments ordered by Communications Minister, Michael Lee, earlier this year. The amendments effectively outlawed SPAs and clarified the legality of Flexi-Plans.

A Too-Clever Idea?

In the face of warnings from Austel not to file any SPA or Flexi-Plan-type tariffs before August, when the DMF is expected to be put in place, Telstra in mid-June filed a raft of replacement tariffs for its 50-odd SPA customers designed to ensure that they were no worse off from June 30, when the SPAs officially end. All tariffs were scrutinised by Telstra's Group General Counsel for Corporate, International and Enterprises (CIE), Deena Shiff. *Australian Communications* understands Telstra's response has been to unbundle the basic carriage service products that once constituted a SPA, and to present them as individually and universally available to any 'class of persons.' Shiff reports directly to CIE Group General Manager, Steve Burdon, as does Telstra's National General Manager of Service Providers, Corporate and Government, John Losco, who has provided input into the DMF deliberations, as well the service provider/resale review.

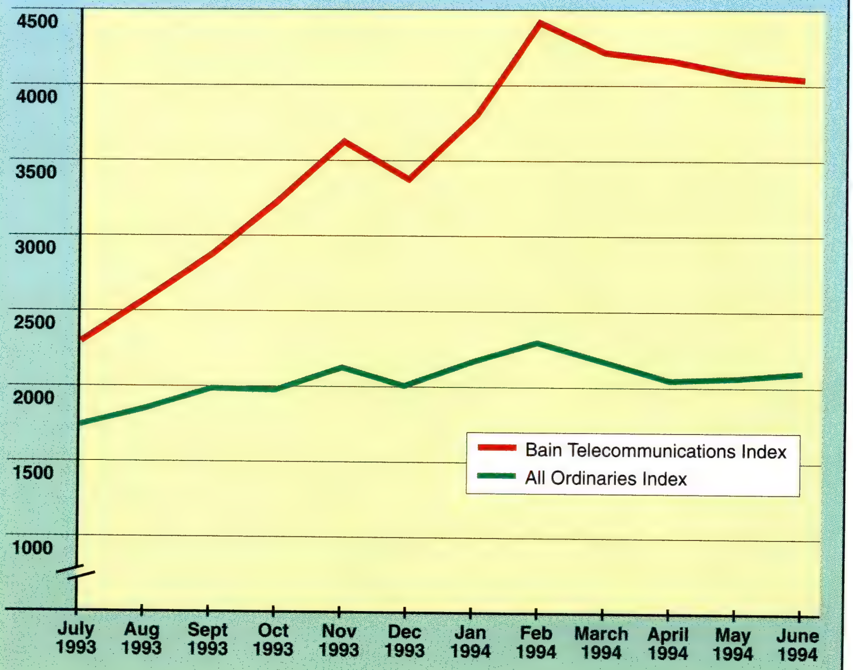
"When we first came up with the concept, we thought the SPAs were a clever idea; we were responding to marketplace needs," Losco said. "But even though the SPAs are dead, we're not surrendering anything. We're competing very aggressively and trying to retain everything. In terms of the service providers, we've been going around talking to them to determine what the market wants. We're looking to have a whole family of products available to them. We've spoken with 35-odd groups including all the big ones like AAPT, as well as some internationals like Sprint and SingCom."

Losco said his division had demonstrated its support for the service provider sector by sponsoring SPAN to the tune of $5,000 at ATUG'94. "We want to see market growth and we're hoping that having more players and more product will achieve that aim," he said. "A lot of things should be clarified around the middle of July."

Losco said his team was now in the process of responding to Austel's preliminary paper on resale and service providers. "We don't have any pre-conceived ideas and we'll endeavour to provide comprehensive answers to whatever questions we're asked." Similar moves are afoot at Optus, where Marketing Manager for Special Projects, Ray Rowland, is preparing responses to Austel's service provider/resale study.

Heading the DMF consultations as well as the resale review, Acting Austel Chairman, Neil Tuckwell, said the DMF was

Stock Watch



The Bain Telecommunications Index (BTI) includes only those public companies which derive the majority of their earnings from the telecommunications sector. It is calculated in the same fashion as the All Ordinaries Index and is maintained by the Australian Stock Exchange Index Office. The formula is:

$$\text{Today's Closing BTI} = \text{Yesterday's Closing BTI} \times \frac{\text{End of Day AMV}}{\text{Start of Day AMV}}$$

where AMV refers to Aggregate Market Value - i.e. total market capitalisation. The start of day AMV is the previous day's end of day AMV and is adjusted for any changes in the BTI such as additions, capital reconstructions, rights issues etc. This ensures that any movements in the BTI are the result of trading activity in that day only.

Company	Market Capitalisation $M	Performance %	Share Price ($)		
				52 Week	
			1/6/94	High	Low
AWA	177	24.3	0.87	1.02	0.60
Datacraft	95	345	0.89	1.13	0.23
ERG Australia	438	161.9	3.38	3.70	1.41
Exicom	77	18.8	0.76	1.40	0.64
JNA Telecommunications	65	26.4	2.20	3.40	1.80
Matrix Telecommunications	133	139.1	2.75	3.65	1.00
NetComm	7	N/A	0.70	1.40	0.64
Scitec	24	326.7	0.32	0.40	0.07
Stanilite Pacific	178	88	6.05	6.70	3.23
Techniche	89	190.5	4.59	6.50	1.50

Market capitalisation is the share price multiplied by total ordinary shares on issue.
Performance is the percentage share price movement over the past 12 months.

Source: Bain & Company

crucial to the regulation of competition in Australia and would apply to a wide range of tasks. For example, these would include the evaluation of service provider products such as Telstra's National Connect, whose tariffs, terms and conditions had been found to be anti-competitive. (Telstra was asked to refile new tariffs before June 30.)

"The DMF will have a very broad focus, covering any tariff of a carrier in a position to dominate a market for a particular kind of telecommunications service. Resale and service provision is the growth area of the future and in that context, SPAs and Flexi-Plans are fairly narrow."

Tuckwell added that the DMF deliberations also touched on Austel's responsibilities to oversee the Chart of Accounts/Cost Allocation Manual (COA/CAM), designed to detect cross-subsidisation by carriers. With a beefed-up Austel budget flagged for the 1994/95 financial year, Tuckwell and DMF Project Officer, Robin Salem, have drafted economists Dr Stephen King of Melbourne University and Professor Rod Maddock of Latrobe University, as well as two Melbourne barristers, including David Shavin, QC. Representatives from the US Federal Communications Commission have also advised Austel's core half-dozen DMF team.

The Twilight Zone

In the twilight zone between June 30 and August, the issue of whether Telstra's unbundling of its SPAs provides Optus and the bigger resellers the chance to do business with large companies and government agencies, previously tied up by Telecom, remains in question. Industry observers believe that while opportunities for Telstra's rivals do exist, most ex-SPA customers will be happy to sit on their fingers until August, then continue with Telstra once the DMF is in place — as long as they end up with the same sort of pricing structures.

Chairman of SPAN and AAPT's Director of Regulatory Affairs, Brian Perkins, said he believed Minister Lee and Austel were doing all they could to promote competition by preventing Telstra from indulging in anti-competitive behaviour. Conceding that Telstra had offered SPAs to some of the larger service providers, he said such deals would only have put these companies on the same tariff rates as Telstra's large customers. "SPAs didn't enable service providers to be competitive. We asked Austel to conduct a review of National Connect, and the conclusion was that the product was anti-competitive, over-priced and its terms and conditions represented high barriers to entry." Perkins added that despite an Austel instruction to Telstra to negotiate with AAPT, Telstra had so far failed to do so.

"My feeling is that Telstra should be compelled to offer more service provider product and we have lobbied the Minister and Austel. National Connect is only an access and termination service and it's not enough. What Telstra should be doing is offering special wholesale discounts on basic services to service providers to enable them to compete effectively at whatever level they choose. Theoretically, anything service providers need should be provided at wholesale rates as distinct from the discounted retail rates for the large corporates."

Continued on page 20

Convergence

Optus Catches the Superhighway Bug

During a press conference at the CommunicAsia '94 exhibition in Singapore in early June, Hongkong Telecom's Director of Strategic Planning, Dr William Lo, gave details of the company's plans to trial video-on-demand services to 400 homes over a hybrid optical fibre and coaxial network. He was asked about costs and financial viability of any future full commercial service.

An evasive answer to such a question might well be expected, but Lo's was probably quite genuine: "I could give you one answer today, but I'd give you a different answer tomorrow. The cost of key components is changing every day."

Cost will be a key factor in Optus' plan to install such a network in Australia, in conjunction with Continental Cablevision to both deliver video services and bypass Telecom's local loop monopoly. Optus announced at the end of May an agreement with Continental Cablevision of the US to 'jointly explore the provision of a wide range of advanced broadband communication and interactive entertainment and information services' to Australian homes.

Many observers saw the Optus move as a plan designed to mortally wound Telecom by striking at what has long been seen as the least vulnerable part of its anatomy: its local loop network. The cost of duplicating this, the argument ran, would be so massive as to deter any competitor. However, if that network can carry many additional and more lucrative services than telephony, such as video-on-demand, and if the cost is not too high then this argument no longer applies.

In a paper presented to the 19th European Conference on Optical Communications held last year in Montreux, Switzerland, Bellcore researcher, Paul Shumante, identified a number of factors which could reduce the whole-life costs of a fibre to the kerb network to below that of twisted pair. He produced models of an upgrade to the existing US network to accommodate video and broadband services for completion in 2010, 2015 and 2020 showed costs of $US130 billion, $US155 billion and $US180 billion.

On a per head of population basis and at current exchange rates, the cost in Australia could therefore be less than $13 billion, or $1,500 per line, and considerably less in heavily populated urban areas. Shumante admitted there were many uncertainties, but clearly the cost picture is changing rapidly making fibre a much more attractive proposition every day.

However, there is another cost factor in the equation which has been raised by Optus itself. It is generally agreed that the main source of revenue from such a network will be video-on-demand. Hongkong Telecom surveyed 1,500 households on their preferred applications for the network. 35% listed video-on-demand as their first choice. The next most popular application was information services, selected by only 5%.

The consensus of the survey was that households were prepared to pay a total of $HK300-$HK380 per month for access to and services on the network. They were prepared to spend more ($HK90) for video-on-demand than any other service; education came second at $HK80. These figures tied in closely with US research, quoted by Lo, except that education came in third at $HK30 per month after games at $HK50 per month.

Scaring Stockbrokers

So, the information superhighway in reality looks like being a video superhighway, replacing the suburban road to the local video shop. If this vision is to be realised, the cost of watching video on the superhighway must be comparable with video rental: on a dollars per bit per second basis, this would make the cost of telephony virtually nil.

This dilemma has been pointed out by The Bureau of Transport and Communications Economics in its analysis of future communications and was identified by Optus Director of Corporate and Regulatory Affairs Andrew Bailey at ATUG'94 when he said: "Suppose that a 2Mbps video connection to a home were valued at the equivalent of the number of phone circuits it could carry — that is about 30. On this simplified basis and based on current interconnect rates, watching a 100 minute movie via cable might equal the cost of hiring a video (about $6), they would be much lower than at present — leading of course to expectations of a knock-on reduction in telephony interconnect costs."

This would please the famous technology visionary Arthur C. Clarke who some years ago predicted that all distance-based telephone charges would disappear at the turn of the century with the world "greeting the new millennium as one great gossiping global family." However it would do little for Optus' bottom line and little to impress its shareholders.

And that is another dilemma for Optus, with a public float expected next year the company is understood to be keeping a tight control on costs in order to look good in the prospectus. But what will potential shareholders think of its superhighway plans?

Not a lot, according to one analyst quoted in *Exchange* telecommunications newsletter. He said, "this country's only got 17 million people and they're going to have to live by their telephones and televisions to make this kind of investment profitable. I'm

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glad that Optus is only exploring these ideas because they could create a lot of uncertainty which will be a big negative for the company when it floats next year." The analyst said that in addition to "dramatically" increasing Optus' expenditure, any move into broadband infrastructure "increases Optus' risk profile and makes it incredibly hard to value."

The analyst also raised the spectre of regulatory intervention by the government in order to preserve universal service and suggested that the market would not be positive about such uncertainty.

After 1997 anyone should be able to be a carrier, so will Optus and Telecom alone still have universal service obligations, and if there is some sort of USO placed on Optus, what about Telecom's obligations for its own broadband network? Surely it will not be exempt simply because its basic telephone service is (almost) universally available? It seems impossible that the government could even contemplate denying Optus the right to give city residents access to new technology and services unless they provide their country cousins with similar services. But this is just one of the many uncertainties facing any planned broadband network.

Stuart Corner is the Managing Editor of Exchange and Editor of Telenews Asia.

Modem Wars

Fair Competition or Predatory Pricing?

Is it a case of the little Aussie battler being priced out of existence by ruthless multinationals? Or is it a case of the little Aussie battler taking on the multinationals at their own game? Whatever the real story, it is almost inevitable that some of Australia's smaller modem makers and importers will go to the wall in the price war raging in the local marketplace. The real question is: will Australian manufacturer and market leader, NetComm, be among them? NetComm scoffs at the suggestion; others are not so confident.

What is certain is that the prices of modems have tumbled by as much as 50% in the discounting frenzy. For example, NetComm's In FaxModem 24 and Pocket FaxModem 24 have been slashed to $199 and the recently released 28.8Kbps SmartModem M11F has dropped from $1,499 to $999. Microcom, a world-leading US modem manufacturer, has priced its 28.8Kbps DeskPorte Fast, with a 14.4Kbps fax capability, as well as its TravelPorte Fast, at $990. Hayes Microcomputer Products, another US multinational, has cut prices by similar margins, and importer Mike Boorne Electronics has released the 19.2Kbps Spirit SMI at a recommended retail price of $399, including tax. Banksia Technology and smaller companies such as Interlink and Maestro have also joined the fray.

Who Fired the First Shot?

Just who started the price war remains moot. Microcom, which set up a one-man operation in Australia only in March this year, claims it did. NetComm says the cuts were a strategic initiative on its part.

According to Microcom's Regional Sales Manager, Australia and New Zealand, Chy Chuawiwat: "We caused [the price cuts] because we wanted to make higher speeds more affordable. NetComm announced their M11F at $1,490 retail in March and we announced ours at $990. They followed us down. We can reduce our prices even further, and we fully intend to. We will be announcing more V.fast product at lower prices in July." Chuawiwat claims to have shipped more than 1,500 units in Australia and New Zealand in the past two months, demonstrating the success of the new pricing strategy.

NetComm Managing Director, Chris Howells, said NetComm had taken a calculated risk to pump up sales volumes. The strategy was based on the US market experience where "both Compaq and US Robotics invested, reduced prices, expanded their outlets and grew their volumes. We are doing the same thing."

"The Australian modem industry has been ripe for some kind of rationalisation for some time. There has been a great deal of gnashing of teeth, but there are too many players in the Australian market. They may think they can form 'Fortress Australia,' but we know the real world outside is not populated by the likes of Hayes and Microcom, but by Boca, Supra, Megahertz, Zoom, Data Race, Pace and others."

"The decision we had to make was this: is it in the interests of Australian employees and shareholders to let new US entrants take an easy profit, or do we provide them with the same sort of competition they are experiencing in the US? In the end, we decided to take them on."

But when NetComm shares slid to just above 50 cents last month, down from their original public float price of $1.20, Howells was forced to explain matters in a letter to the Australian Stock Exchange. NetComm had experienced slower than anticipated progress in the export market, he reported, but domestic sales volumes had risen 40% during the past two months as a result of the price cuts. The company had also revised downward by about 8% the $25 million forecast revenues for 1993/94, and its forecast $288,000 net profit before tax by 10%. "The company believes that the operating profit before abnormal items and tax should be within 15% of the Prospectus forecasts," the letter concluded.

Howells told *Australian Communications* he was optimistic that an export deal with the UK would be finalised, but this "won't happen today." Stressing that NetComm would remain a "lean and mean" operation, Howells stopped just short of confirming this may involve cuts among the company's 135 staff.

Another factor in the price war is the time and money involved in having new and imported equipment tested and approved by regulator, Austel. But spokesman Jack Shellbourne rejected industry claims that testing could cost anywhere between $5,000-20,000 and that the entire process took too long.

Customer Operations Manager at Comtest in Melbourne, Terry Nisbet, says: "If we have all the relevant documentation, the equipment and a signed copy of our estimate, we can complete a test in four weeks." The highest test price for a modem was $7,700, not the claimed $20,000, he added. According to Laboratory Manager at Austest in Sydney, Martin Garwood, while Austel's standards are higher than the FCC's in the US, they are not as tough as the UK's BABT, which requires manufacturing facilities to be accredited and regularly inspected at the proprietor's expense.

A Shake-Out Looms

Few other players in the Australian modem business share Chris Howells' enthusiasm about NetComm's new pricing strategy. According to MBE Managing Director, Mike Boorne: "Chris may be right in terms of taking the model of US Robotics. He is correct in quoting what their experience has been, but the difference is the United States has a population of 270 million, as opposed to 17 million in Australia. US Robotics can work on a 10% mark-up and still operate profitably."

Banksia Technology's Managing Director, David Stewart, predicted there was "a better than 50% chance" that NetComm would end up in trouble. "I believe they have to restructure their staff levels and their method of production," he said. "There will definitely be casualties from the price war and everyone will have to tighten their belts to survive, especially people importing unapproved product."

Stewart said he believed NetComm's strategy was seriously flawed. "They have between 45-50% of the market and they say they want to double turnover. There's no way they can achieve 90% of the market," he said. "But I agree the price cuts will grow the overall market."

Hayes' Country Manager for Australia and New Zealand, Andrew Philips, said

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after-sales service and support would help maintain Hayes' market share, despite the price war. "We have the only free 1800 telephone support hotline for modems in Australia and when you're dealing with highly sophisticated network products like Novell NetWare Connect, Lotus Notes and Banyan Vines, people expect high levels of support and technical ability."

"We believe NetComm has chosen an unsophisticated market strategy. If it was done because of the entry of strong American suppliers into the local market, that's pretty silly. Hayes operates in 60 countries and can manufacture over a million modems a year. We'll always be able to be competitive with local companies. We are a technology leader, not a market leader, like NetComm. But we'd have to be pretty arrogant if we didn't match their prices."

Bernard Levy

Australian Industry

A New Start For QPSX?

In the middle of May, Telecom put out a press release which began by telling us that 'Telstra has reaffirmed its commitment to high-tech research and development subsidiary, QPSX Communications.' Statements of this kind inevitably provoke suspicion of a problem, so why did Telecom feel it necessary to 'reaffirm' its commitment to QPSX, the inventor of the DQDB MAN technology (IEEE 802.6) known in Australia under the brandnames Fastpac 2 (2Mbps) and Fastpac 10 (10Mbps)? And why, all of a sudden, is QPSX being referred to as a 'subsidiary' of Telecom?

A few years ago QPSX Communications was formed as a West Australian company (now with 85 staff) in which Telecom had 51% of the shares. The University of Western Australian (UWA) and the key academics/developers of the DQDB 'queuing technology' owned the rest. Telecom subsequently increased its stake in QPSX to 78%, and the word is that it now owns nearly 90%. This sort of dilution of share ownership among the key members of the research team usually only happens when a company desperately needs working capital, and in a company as mature as QPSX, this might mean it has cash-flow problems.

Telecom's press release says QPSX's 'operations inject about $15 million per annum into the economy. The level of expenditure adds about $60 million annually to Gross National Product.' Since most of the company's income must come from exporting products or from overseas licensing, the discrepancy between the $15 million in export income, and the $60 million added to the GNP, must come from substantial capital injection or borrowings, one might think. But you'd expect the balance to be this way in a research-based company at the beginning of the ATM era.

This may be why Telecom has entertained the idea of selling out its controlling interest. The US-based Columbia Group is said to have offered $40 million for Telecom's stake, but last month the bid was finally turned down. Ross Norgard, the long-serving Chairman of QPSX, also departed at this time. He had been actively promoting the Columbia buy-out in order to get cash for the company to expand. Telecom has now decided that in future only Telecom people will sit on the board.

QPSX's DQDB technology was licensed to Alcatel and Siemens a few years ago, and, in Australia, Alcatel has been making Fastpac/SMDS products for local consumption and for export. Alcatel says that its had a boomer of a year in the export market, so this doesn't look like a technology in trouble. But DQDB has been slow in America and Europe where the technology is used a bit differently to the way we use it in Australia. They have a slightly modified network-access standard known as SMDS (Switched Multimegabit Data Service) which has long been tied up in implementation disputes between the various RBOCs and interexchange carriers. Recently, they seem to have shaken out their interconnection problems.

However the development of SMDS was something of a bind on the Australian Fastpac service, because the major manufacturing vendors now design their network devices for the large SMDS market, but ignore the small Australian Fastpac market. This limits the range of devices that can connect to the local MANs.

Recently this problem was solved by Telecom funding Scitec to develop a Fastpac/SMDS protocol converter. Scitec managed to take their low-cost Fastlane multiplexer and modify the software enough to create this device; and they added a management system that was sorely needed over Fastpac. The software in each router still needs to be adapted for Fastpac, but these changes are now minor.

Calling All Users

So how well is Fastpac doing in Australia? When quizzed on the number of current Fastpac users during the preparation of this article, Telecom at first displayed considerable reluctance to reveal any details but eventually divulged that there are 'currently 50 Fastpac services in use.' The majority of these are Fastpac 2 services and users include BHP, IBM, Shell, Alcoa, the NSW Water Board and the Australian Bureau of Statistics.

Alcatel also uses Fastpac, and says that it is technically excellent — but it isn't exactly an unbiased customer. The Bureau of Meteorology figured in the original trials, using Fastpac to ship large satellite image files from their Perth earth station to the computers in Melbourne. They confirm that the service is technically excellent, but say that after the trial period they couldn't afford to pay Telecom's rates.

Perhaps one other factor limiting success is the quality and flexibility of Telecom's competitive DDS service, which is possibly as good as any in the world.

There are also questions about the long-term viability of SMDS in the States, with the gurus being divided between those (led by MCI) who see it as the best approach to take for the next few years, and the ATM crowd who believe that SMDS's window of opportunity has already closed.

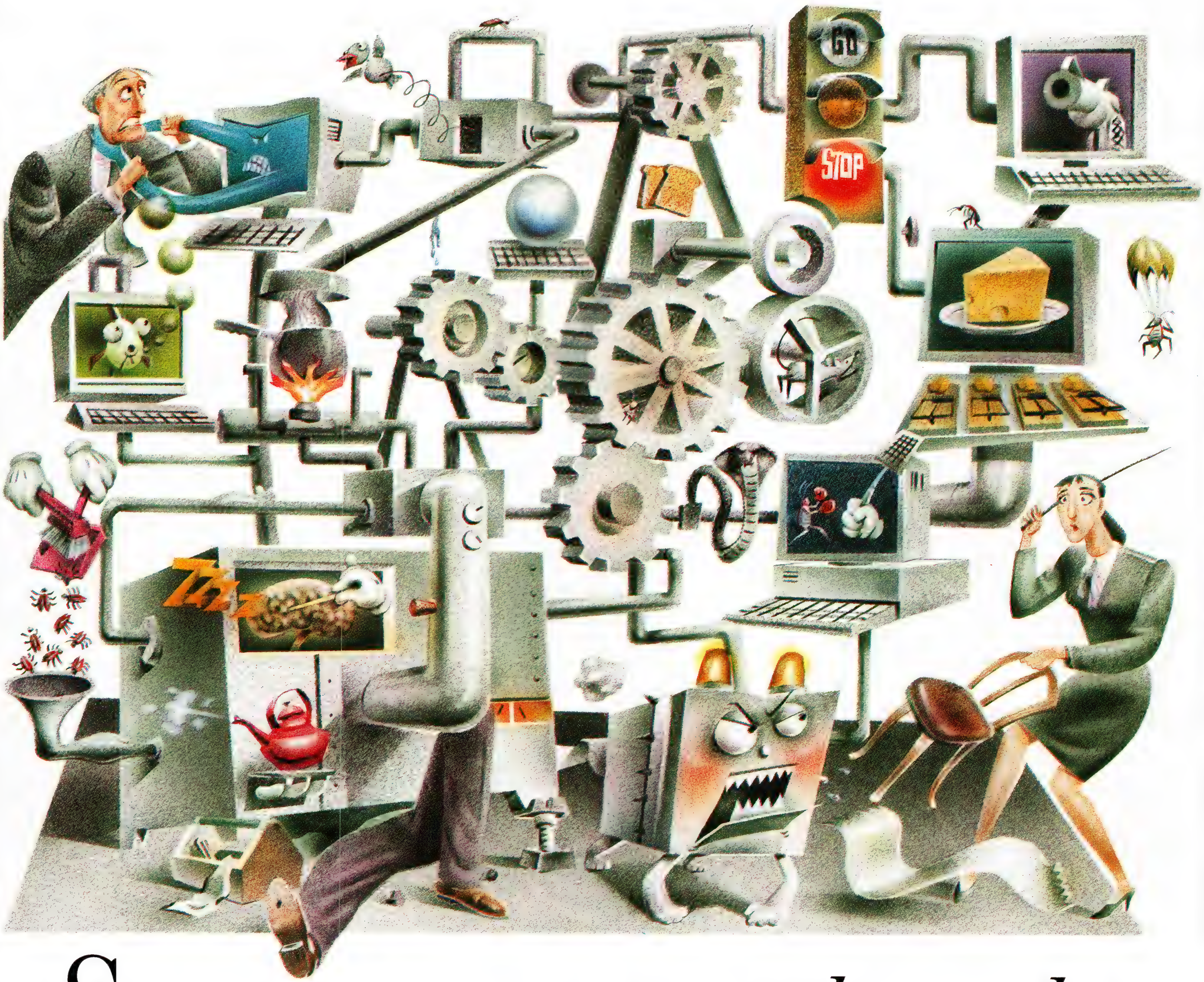
However, some new markets may be opening up. Back in February, the SMDS Interest Group established a new low-speed access rate of 56/64Kbps. This low-rate small-business standard is based on frame relay and connectionless datagrams and so it is cheap and easy to implement. Ameritech were the first to offer the low-cost access rate; BellSouth (the power behind Optus) is now promoting it also; and Bell Atlantic will be offering the rate by the time you read this.

Meanwhile, QPSX charges ahead, recently announcing an upgrade to the DQDB cell-switch to support larger networks; those with more interfaces needing a more flexible addressing scheme. This switch is high in capacity, offers both voice and data and is very simple to manage (voice is another option that Telecom could offer on Fastpac, if it is serious about promoting the technology).

There seems to have been a switch in emphasis away from public networks to larger corporate and campus nets which need high-speed backbones; they are selling DQDB to these organisations as an alternative to FDDI. More recently, the company has produced an ATM chip-set which will interface to ATM bearer services as defined by the US-based ATM Forum. This takes them out of the DQDB era, and into true ATM.

So QPSX seems poised to play an important role in the next generation of telephone networks, even if its Fastpac MAN doesn't have much of a future. If we do believe in promoting smart industries in the smart country, then QPSX is the type of research-based corporation we need for the future, even if it isn't doing too well in sheer financial terms today. So we can only applaud Telecom's decision to keep ownership within our national boundaries.

Stewart Fist



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Globalisation

Telstra Joins AT&T's WorldPartners

In the space of a couple of weeks in May last year, AT&T, along with KDD and Singapore Telecom, announced the creation of 'WorldPartners' and BT announced that it planned to buy 20% of MCI. Following the creation of Syncordia and Project Cyclone by BT a couple of years earlier, the moves were seen as confirmation that the world was polarising into two 'supercarriers.'

A year down the track the threat of WorldPartners seems somewhat less than when it was first announced. Service introduction is at least six months behind the schedule announced at the time (the first services were launched only a couple of months ago). Also it seems that earlier claims that Unitel of Canada, Korea Telecom and Telstra had joined the three founding members as associates was not quite correct, in spite of public statements last July by AT&T Chief Bob Allen to that effect.

Their non-participation was only revealed early in May this year when Telecom New Zealand announced it had become the first associate member of WorldPartners. Within weeks Telstra also announced membership. Unitel and Korea Telecom have yet to do so.

Telstra's statement was notable for what it did not say more than for what it did. No quotes from senior executives along the lines of 'what a great thing this is for our customers,' simply five brief paragraphs stating what WorldPartners was and what services it would offer. The Telecom NZ release, by contrast was very effusive.

So, WorldPartners' track record is not looking too good to date. After an initial announcement of three associates, it turns out that a year later it had scored only one: a carrier in a very small nation far away from the main centres of Asia and Europe.

WorldPartners is a company headquartered in New York with equity held by AT&T (50%) KDD (30%) and Singapore Telecom (20%) and a board of directors comprising representatives from these three carriers. They have committed to spending in excess of $US100 million on the venture. WorldPartners will offer services under the name WorldSource.

WorldSource services will include a virtual private voice network, frame relay and high-speed leased line services. Customers will be offered a single point of contact from any WorldPartners member, with billing in the country and currency of their choice.

Progress may be slow, but AT&T is very keen to recruit additional associate members to WorldPartners. In a speech to the European Chairmen's Symposium in Berlin last July, CEO Allen said "We expect to have a virtually unlimited number of partners around the world, typically the PTTs or privatised national telecommunications companies." He went on to reassure his audience "The intent isn't to lock up national markets and keep out competition."

It's hard to see how there will be any competitors left if WorldPartners' membership is 'virtually unlimited,' but perhaps that was just poetic licence. According to a report in the Fintech *Telecom Markets* newsletter at the time of the launch, AT&T's intentions are not so benign. "AT&T is challenging Europe's telecommunications operators to join (WorldPartners) or face the prospect of an assault on their most lucrative business customers . . . WorldPartners is aimed at the world's 2,000 to 3,000 multinational companies which spend $US10 billion per year on telecommunications services, according to AT&T. This figure, it says, will grow by 12% per year to reach $US25 billion by the year 2000."

A Reluctant Partner?

Telstra perhaps may have had little choice but to join. Few major multinationals are headquartered in Australia and if AT&T or one of its WorldPartner allies succeeds in tying the head office into a global agreement, the regional office will follow suit and local carriers like Telstra will be left with little opportunity to add value. They will simply be in the business of providing international leased circuits to carry traffic on networks that are managed and billed for elsewhere. Profit potential is increasingly in adding value and less in simple carriage.

However the picture is far from clear cut. Telstra, through its participation in Sprintnet, was already committed to providing international frame relay services and was also a participant in Sprint's international virtual private network service. Sprint is unlikely to be asked to join WorldPartners because it is a direct competitor to AT&T. Telstra and AT&T are also members of Financial Network Services, a consortium of carriers dedicated to providing seamless communications between world financial centres.

The world's international carriers are well used to the idea of co-operating and competing with each other, but as their global plans become more aggressive and as new technologies make it easier for them to spread their tentacles into other markets these co-operative ventures are likely to feel the strains of simultaneous competition.

An incident in Singapore recently highlighted this issue only two well. In an attempt to recruit Singaporean customers for its international calling card, AT&T organised a direct mail campaign. One recipient, so it is said, was none other than the President of AT&T's WorldPartners partner, Singapore Telecom. The gentleman is said to have been less than pleased with AT&T trying to steal his business and to have threatened to divert some of AT&T's share of US-Singapore traffic to AT&T's competitors. Simultaneous competition and cooperation may be OK, but incidents like that are unlikely to sweeten the cooperative relationship.

Stuart Corner is the Managing Editor of Exchange and Editor of Telenews Asia.

SPAs from page 14

Perkins said that while Optus appeared to be open to offering service provider product, much of Telstra's middle management was stuck in the "dark ages" of the old monopoly. "Telstra still hasn't fully taken on the spirit of competition. Some management cannot see that you can be open to competition and lose market share, but still increase revenues and profits. Fortunately, these people tend not to be at the highest levels [of Telstra management]."

Asked whether Austel felt it was necessary to order the carriers to offer more product to service providers, Austel's Neil Tuckwell said that while there were references in the *Telecommunications Act* to service providers and the provision of services to them, and Austel had certain powers, in the end it was up to the carriers. "Any Austel view along those lines would come out of the study, and the first thing to do is to better understand the service provider market and its requirements. How those requirements are met is another issue." The review will seek extremely wide input, he said.

Austel's Manager, Pricing and Quality of Service, Chris Pattas added that under Austel's powers to declare a 'class of persons' in favour of resellers, it would need to be convinced that doing so, it was promoting competition. "This begs the question whether Austel should be declaring 'class of persons' at all, or whether, on the other hand, we should be giving consideration to some disadvantaged groups, for example. While we're not envisaging going down that route, again the real issue is resellers and whether this would promote competition."

"What we are trying to do is ensure that if people want to provide services, they are not disadvantaged and the rules of the game are as fair as possible. In maximising their opportunities, we want to see customers get the primary benefits, which is the whole point of competition. All industry players, including Telstra, have responded positively. How Telstra may feel about it internally is another matter."

Bernard Levy

New Zealand

Divisions Over Foreign Dividends

Four years after privatisation, Telecom Corporation of New Zealand (TCNZ) remains a political raw nerve. When, earlier this year, the company announced record profits, the news hit the front pages of New Zealand's newspapers as well as radio and TV bulletins. However, the story run by the media was not a celebration of TCNZ's business acumen. It focused more on the negative public reaction to TCNZ's profits in the light of its recent staff layoffs. Equally, the fact that some 90% of that profit was paid out in the form of a large dividend to — mainly American — shareholders, painted the result as a minor scandal.

TCNZ Chairman Peter Shirtcliff told investors that dividends are likely to be "at least equal in absolute terms" in coming years. Bell Atlantic and Ameritec own some 49.9% of TCNZ shares. So this news did little for TCNZ's public image.

In the year to March 31 1994, TCNZ made a record after tax profit of $NZ528 million on revenues of $NZ2.5 billion. This figure was a 15.4% rise on the 1992-93 operating profit of $458 million. However, during the earlier year, one-off restructuring costs reduced the reported profit to $NZ108 million.

Critics argue the size of the profit shows TCNZ should not have been privatised, but TCNZ says that it paid $NZ210 million in taxes last year — more than it ever paid the government as a dividend. Harder to justify is the sheer volume of money flowing out of the country in dividends — around $NZ-200 million. However, TCNZ counters by pointing out that the overseas shareholders have invested more than $NZ4 billion in the last five years and as a consequence New Zealand now has one the world's most advanced networks.

Earnings for the 1993-94 year rose just 1%. In the earlier year the total revenues actually fell. During the last year, TCNZ reined in costs by some 3.9%.

Overall, TCNZ said that increased revenue from services, such as 0800 and 0900 numbers, cellular, network services and directories more than offset the falls in national and international toll revenue.

Though toll revenue fell, actual call volumes showed significant rises. National call volumes rose 9.9%, outgoing international call volumes increased 11% and incoming international traffic was up 12.4%. TCNZ's market share fell to 81% of national traffic and 78% of international traffic. In 1991, it had 100% of both markets. The number of installed lines increased 3.8% to 1.6 million. Overall, these figures were good, but pale when compared with the 43.5% increase in cellular connections.

Much more controversially, staff numbers were cut 25% during the year. More than 3,000 jobs were lost. By the end of March, staff numbers were 9,327 compared with 27,000 when the business was split from the Post Office. Further reductions are planned as new systems come on-line.

The staff cuts reduced personnel costs by almost 12% and some critics argued that TCNZ's increased profits came at the cost of those jobs. In fact, the savings only contributed some $50 million to the year's bottom line. TCNZ boasted that these measures led to increased efficiency. The business now operates with 202 lines per employee as opposed to 142 lines a year earlier.

There is another aspect to the improved profits. Last year TCNZ came to the end of a massive investment programme. This was only partly financed by shareholders. Much of the investment was made by the NZ Government in the run up to privatisation.

Bill Bennett

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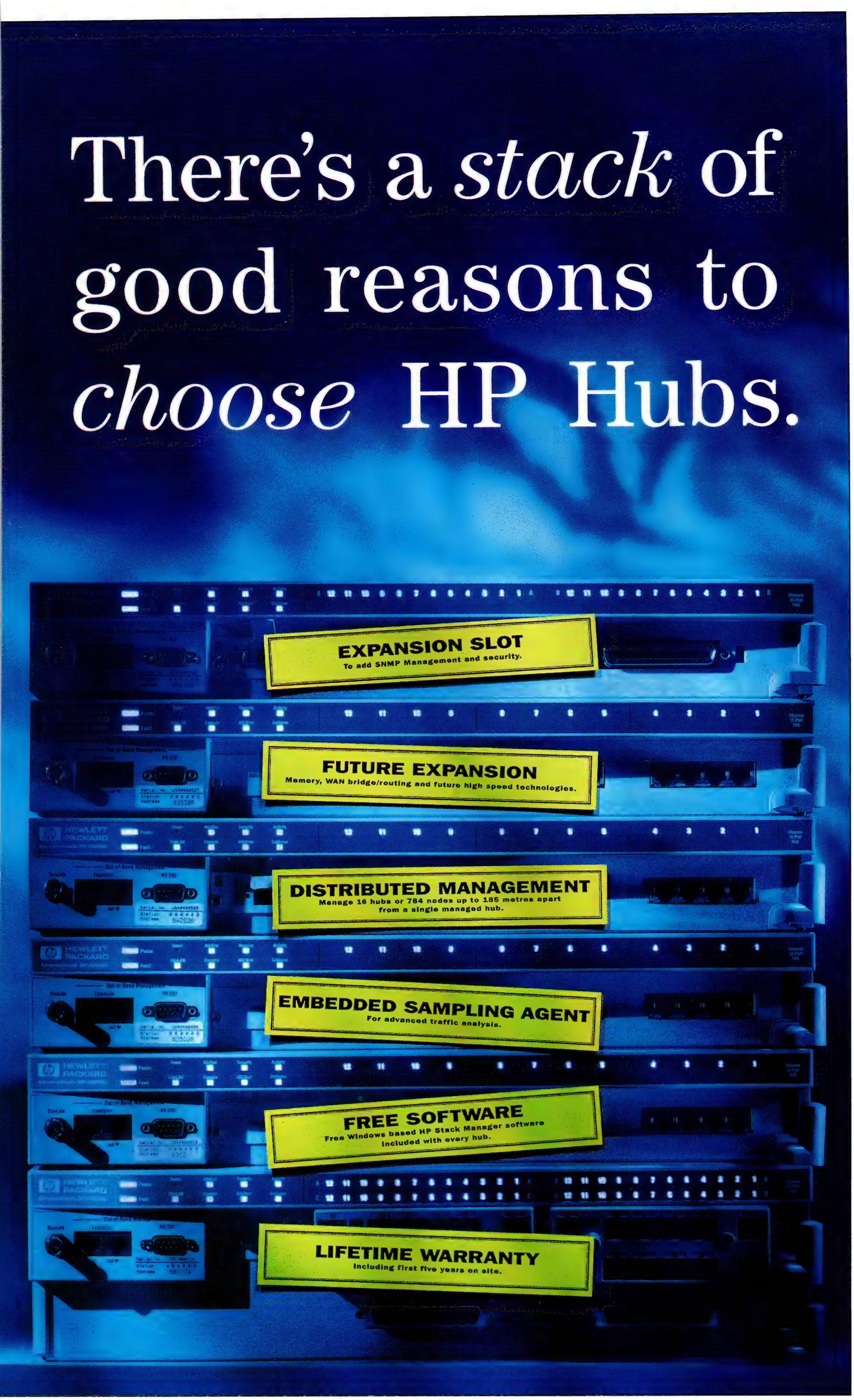
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DLSw: The Great Debate Turns Into the Great Divide

Proprietary extensions and missing pieces plague Data Link Switching on the road to standardisation.

A draft standard hasn't even gone to the IETF yet, but some router vendors have cranked up their marketing machines to let the world know that their products 'comply' with Data Link Switching. Other vendors are equally adamant that their gear already delivers everything defined in DLSw — and then some — adding that when the proposed spec is ratified they'll have no trouble at all achieving full conformance.

Just to keep things interesting, a third group agreed that DLSw is critical to SNA internetworking but won't actually build it into any boxes until the standard is cast in stone.

It wasn't all that long ago that most router vendors were hailing DLSw as the key to interoperable schemes for transporting SNA over TCP/IP networks. Things have certainly changed: DLSw has become a catchall term that's come to mean everything and almost nothing when it comes to internetworking SNA.

To some, DLSw is synonymous with RFC 1434, a subset of the switch-to-switch protocol that IBM originally implemented in its 6611 router. RFC 1434 is an informational specification from the IETF (Internet Engineering Task Force) that defines a limited set of features and functions like encapsulation and termination (see the table on page 25). To others, DLSw is a draft standard that will go the IETF sometime later this year. Still others see DLSw as IBM's proprietary way of handling SNA on TCP/IP. In fact, many of the major players in the router market offer DLSw-like features, but until the standard is approved and products are made to comply, interoperability will not be achievable.

But even an approved standard won't lay these problems completely to rest: the DLSw draft spec suffers from some glaring omissions, particularly traffic prioritisation and a way to combat NetBIOS broadcasts.

The DLSw Dividing Line

Here's how things stand at the moment: of the so-called DLSw routers that are being hyped so heavily, only equipment from IBM, Proteon, and Wellfleet Communications actually implements the technology as it's spelled out in RFC 1434. But the same vendors are also busily at work writing their own proprietary extensions for some of the features and functions which are listed in the draft spec.

Meanwhile, Cisco Systems and 3Com refuse to comply with the RFC while implementing proprietary technology that both vendors claim can deliver many of the functions spelled out in the draft standard. Cisco, in fact, recently mounted a barnstorming press tour to tell the world why RFC 1434 is unimportant. And Crosscomm and RAD Network Devices both say they'll soon release proprietary DLSw routers of their own.

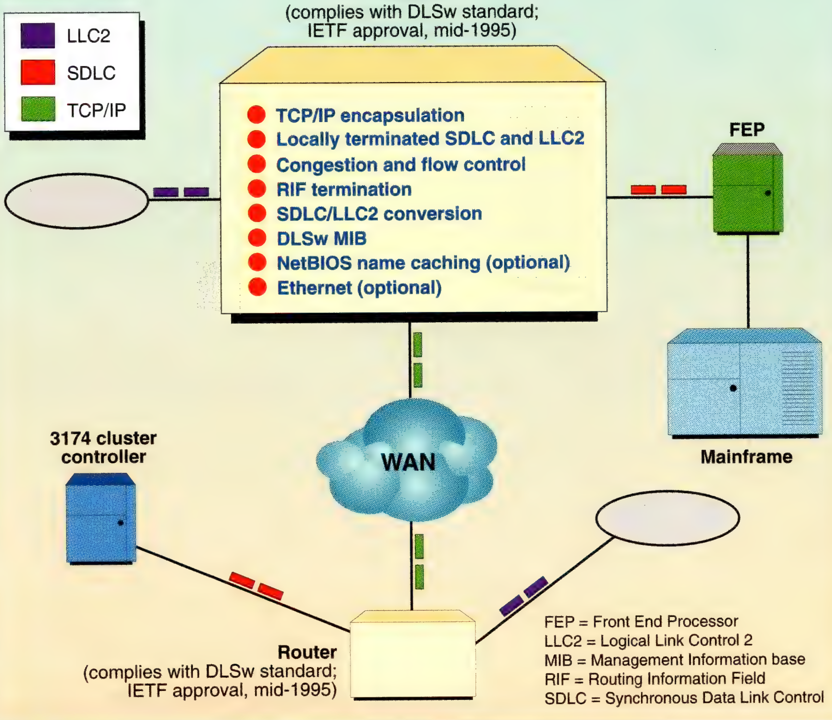
There's at least one more headache in the making for overstressed net managers. IBM has recently announced its new Dynamic LU Requester/Server (DLUR/S), a mechanism that will enable APPN to ship SNA traffic over TCP/ IP. But Big Blue's announcement raises an interesting question: if APPN is going to be used to integrate SNA into LAN internetworks, why bother with DLSw at all?

As could be expected, the entire debate over DLSw has proved controversial. For example, The Tolly Group, an independent test facility and consulting firm, wanted to evaluate products from all five vendors that offer some form of DLSw.

According to company president Kevin Tolly, when IBM, Proteon, and Wellfleet found out that Cisco and 3Com would be tested, they baulked — arguing that only those vendors that conformed to the RFC 1434 spec could be considered to have DLSw gear. Cisco and 3Com countered these objections by saying that RFC 1434 is not a standard and thus is not a valid

DLSw: The Shape of Things to Come

When the IETF approves the DLSw standard, routers that are built to spec will be able to encapsulate SDLC and LLC2 frames in TCP/IP and send them over a WAN internetwork. But because the standard designates some features as optional, interoperability will remain less than complete.



FEP = Front End Processor
LLC2 = Logical Link Control 2
MIB = Management Information base
RIF = Routing Information Field
SDLC = Synchronous Data Link Control

measuring stick for determining what constitutes Data Link Switching.

The end result is that the Tolly Group is running two separate tests. One will look at Proteon, Wellfleet, and IBM; the other, Cisco and 3Com. Tolly comments that the two evaluations are very similar and will benchmark performance and congestion control. Since the trials are still in progress he can't release specific results but does say that he has seen 'excellent performance,' with SNA sessions staying alive even when the link is congested.

DLSw Dropouts

Unfortunately, even when the DLSw standard is ratified by the IETF (by the middle of 1995 at the latest), it will not put an end to all the arguments or the proprietary extensions. The draft standard put together by the DLSw Related Interest Group, a semi-autonomous organisation within the IBM-sponsored APPN Implementers Workshop (AIW), does not address NetBIOS.

More specifically, the DLSw standard will list NetBIOS name caching, a way to help reduce broadcast messages, as an option. The means that vendors will be free to ignore the option or, worse, implement it via proprietary techniques. That could spell the end to anything but very low-level interoperability.

"NetBIOS name caching is an absolute necessity for most *Fortune* 1000 companies," said Tolly. "Net managers are looking to DLSw to deliver interoperability. That won't be the case if products are cobbled together with different sets of options."

The draft standard also lists Ethernet support as optional and does not address traffic prioritisation.

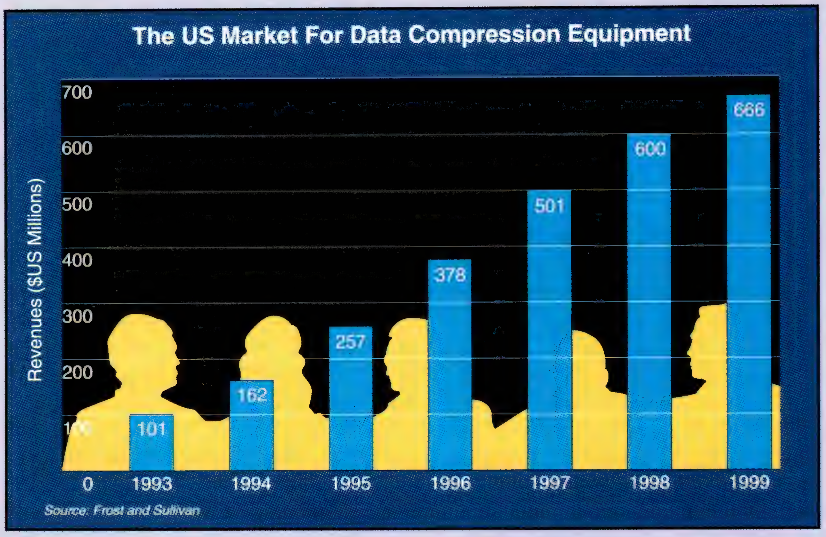
The DLSw Deal

DLSw is the latest in a long history of technologies intended to transport SNA and NetBIOS over LAN internetworks and eliminate the parallel networks that were originally used to separate LAN and mainframe traffic. Network managers with long memories can probably recall the first scheme, tunnelling, which encapsulates SNA in TCP/IP and sends it over the wide area. Local termination was later added to tunnelling, in an attempt to keep SNA and NetBIOS polls, broadcasts, and acknowledgments off the WAN.

IBM itself put forth APPN (Advanced Peer-to-Peer Networking) as part of its Blueprint as a way for SNA equipment to communicate on a peer-to-peer basis — a first step on the road to routing SNA and NetBIOS. APPI (Advanced Peer-to-Peer Internetworking) was Cisco's reply to APPN, which it later scrapped rather than getting into a battle royal with Big Blue.

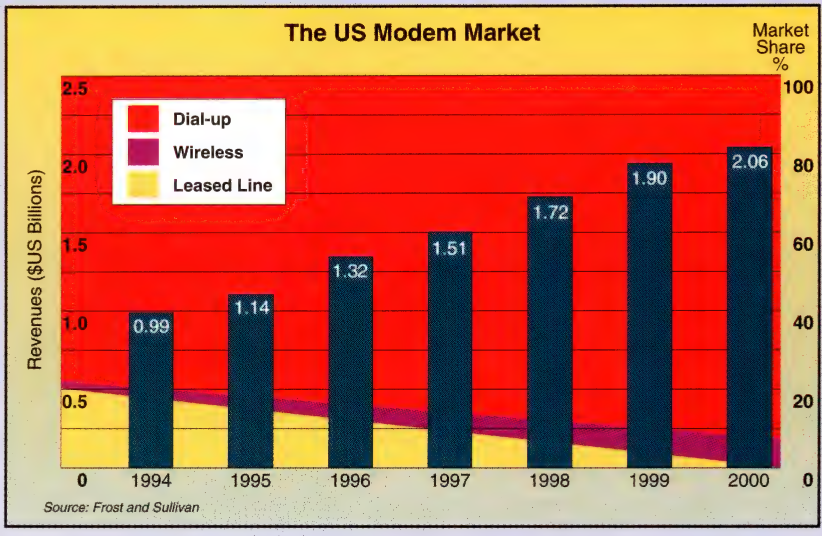
In essence, Data Link Switching is a mechanism that encapsulates SNA within TPC/IP in order to route it over the wide

Market Watch



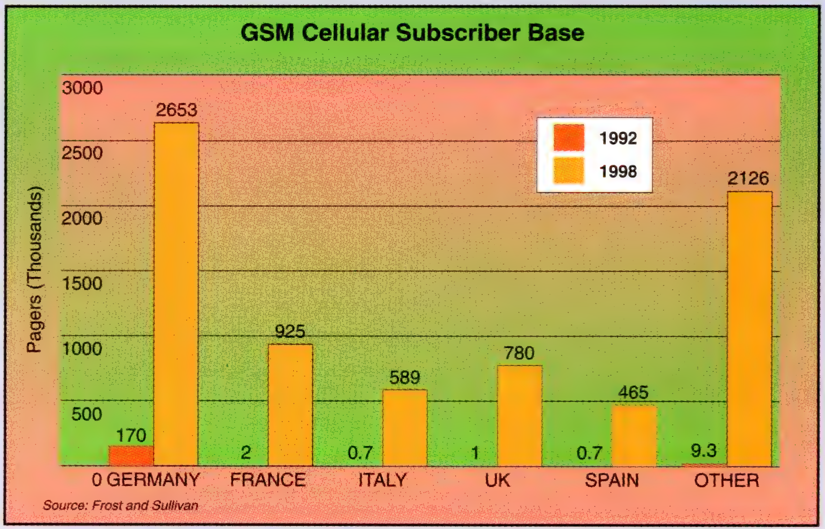
The US Market For Data Compression Equipment

Source: Frost and Sullivan



The US Modem Market

Source: Frost and Sullivan



GSM Cellular Subscriber Base

Source: Frost and Sullivan

DLSw's Not So Delicate Balance

FEATURES	RFC 1434*	DRAFT DLSw STANDARD	PROPRIETARY EXTENSIONS	APPN
Flow control		✓	Cisco, IBM, 3Com, Wellfleet	✓
Congestion control		✓	Cisco, IBM, Proteon, 3Com, Wellfleet	✓
Fault tolerance/dynamic rerouting	✓	✓	Cisco, 3Com	✓[1]
Traffic prioritisation			Cisco, IBM, Proteon	✓
3270 support		✓	Cisco, IBM, Proteon, 3Com, Wellfleet	
TCP/IP encapsulation	✓	✓	Cisco, 3Com	N/A
Locally terminated SDLC and LLC2	✓	✓	Cisco, 3Com	✓
RIF termination	✓	✓	3Com	N/A
SDLC-to-LLC2 conversion		✓	Cisco, IBM, Proteon, 3Com, Wellfleet	✓
LLC2-to-SDLC conversion		✓	Cisco, IBM, Proteon, 3Com	✓
DLSw MIB		✓	IBM, Proteon, 3Com, Wellfleet	N/A
NetBIOS name caching		Optional	Cisco, IBM, Proteon, 3Com, Wellfleet	N/A
Ethernet support		Optional	Cisco, Proteon, 3Com, Wellfleet	✓

* Routers from IBM, Proteon and Wellfleet comply with RFC 1434

1 Yes, but session interrupted

LLC2 = Logical Link Control 2

SDLC = Synchronous Data Link Control

MIB = Management Information Base

RIF = Routing Information Field

N/A = Not Applicable

area. Here again, though, vendors are taking separate paths. IBM, Proteon, and Wellfleet are following RFC 1434; Cisco and 3Com have come up with schemes of their own (see the table, again).

RFC 1434 and the draft specification also address fault tolerance and dynamic routing, local termination, and RIF termination. Both Cisco and 3Com have written proprietary extensions to implement these features.

Local termination of SDLC (synchronous data link control) and LLC2 (Logical Link Control 2) sessions keeps mainframe polling and acknowledgments off low-bandwidth leased lines — thus preventing session timeouts.

To do this, a DLSw router responds to mainframe polls as if it were a terminal connected to the host on a Token Ring (see the figure on page 23). This sort of spoofing fools the mainframe into thinking that the remote terminal has received its poll. On the other end of the link, the router spoofs the terminal into thinking it's still talking to the host.

RIF (routing information field) termination lets the entire wide area network be viewed as a single hop, a critical concern for source route bridging, which imposes a seven-hop limit.

Draft Dodgers

The draft standard addresses a number of other issues, including flow and congestion control and conversion. Since these are not covered by RFC 1434, all implementations are completely proprietary. What's more, vendors differ in which other features and functions they currently can deliver. For instance, all of them offer SDLC-to-LLC2 conversion, but Wellfleet has yet to offer LLC2-to-SDLC conversion.

Taken together, the two capabilities make it possible for serially attached devices such as cluster controllers and FEPs (front-end processors) to communicate with gear on Token Rings. If this conversion capability were not available, net managers who needed to ship SNA traffic to users on Token Rings (a fairly typical scenario) would either have to shell out for a standalone converter or attach the FEP to a Token Ring, an expensive proposition.

Similarly, all the vendors offer some form of congestion control, while Cisco, IBM, 3Com, and Wellfleet have come up with their own takes on flow control. These two functions give a router a way to tell end-stations to throttle back on transmissions and signal other routers to stop forwarding packets.

As indicated, what's missing from the draft standard may well prove just as important as what it includes — NetBIOS name caching.

NetBIOS is a LAN protocol — a very chatty one. When a NetBIOS station comes on-line, in fact, it sends three broadcast messages within 0.5 seconds to announce its presence. And when one NetBIOS station wants to communicate with another, it simply broadcasts a message to every station on the LAN. The right station picks up the message; the others ignore it.

That's not really a problem on a dedicated LAN, which has plenty of bandwidth. But when these broadcasts are transported over low-speed wide area links, they can quickly cause network congestion, forcing packets to be dropped and preventing other traffic from getting through. In a worst case scenario, NetBIOS has the ability to cause devastating broadcast storms on a wide area network.

What's In a Name?

NetBIOS name caching deals with this problem by enabling a router to maintain a table that indicates which LAN every NetBIOS station is on. When a station attempts to broadcast a message, the router intercepts it and only allows it to reach the destination LAN of the target station. The router can only run this sort of interference, however, once it's allowed a broadcast to go through onto the wide area. The router builds its table from the information that it gathers when NetBIOS stations answer the broadcast.

There is one final issue which must also be considered: IBM's recent announcement of DLUR/S as a way for APPN to integrate 3270 SNA onto router-based internetworks. Here's a quick look at how the new software works: DLUS is installed on the mainframe under VTAM: DLUR runs on peripheral APPN nodes, including routers. When VTAM wants to initiate a session with a 3270 terminal, it sends a message to the router attached to the target 3270. The router sets up a control session between the host and the terminal. Once again, 3270 traffic is sent over the network encapsulated in TCP/IP.

For some, DLUR/S raises the possibility of sidestepping DLSw entirely. Time may well be the deciding factor here: IBM is almost finished with DLUR. DLUS, however, won't be ready until sometime in 1995. Since the two packages need to be used in tandem, network managers in a hurry to route SNA traffic may want to follow the DLSw trail — as rocky as it seems at this point.

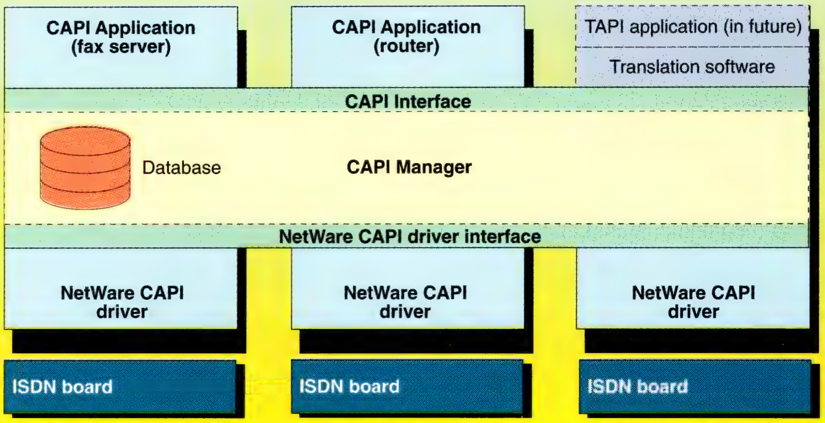
Eric Birenbaum

ISDN

New ISDN APIs Free Applications From Adaptors

CAPI Manager Up Close

CAPI Manager makes it possible to mix and match ISDN applications and adaptors in the same NetWare server. The NLM's database stores details about hardware and software and uses them to allocate ISDN resources. For example, if the fax server needs to set up a call, it sends a message to CAPI Manager, which returns a list of boards capable of handling its request. The application then picks one and passes along a command to set up the call.



API = Application Program Interface TAPI = Telephony API CAPI = Common ISDN API

When Novell and Microsoft defined hardware-independent interfaces for LAN adaptors, they broke the chains that bound applications to specific cards. Developers wasted no time taking advantage of this new-found freedom, flooding the market with network software. What's more, the ensuing competition drove down prices and encouraged further innovation. The rest, as they say, is history.

Now the two software giants are hoping they can make history repeat itself, this time with ISDN. Novell has teamed with German software developer High Soft Tech Engineering GmbH to create CAPI Manager, an NLM (NetWare Loadable Module) that makes it possible to mix and match ISDN cards and applications in the same NetWare server. The joint project, which builds on the German CAPI (Common ISDN API) standard, also has yielded a spec for NetWare CAPI driver interfaces that's been implemented by several board vendors. Any NetWare application that uses CAPI messages and any ISDN board with a NetWare CAPI driver can work with the CAPI manager NLM.

Microsoft is also working with ISDN APIs but with a different goal in mind. The company's TAPI (Telephony API) gives developers a way to write software that lets PC applications control telephone handsets. TAPI is a high-level interface that works with ISDN or other telecom services. Microsoft indicates that it has already issued more than 10,000 TAPI software developer's kits and says it will support the API (application program interface) in its next release of Windows, scheduled for the end of the year.

It looks as if the two software projects will go a long way to fuelling interest in ISDN. And Novell and Microsoft have the clout to make their APIs de facto standards. Up until now, the industry has pretty much ignored similar offerings, such as ASI (Application Software Interface) from the North American ISDN User Forum and PCI (Programming Communication Interface) from the European Telecommunications Standards Institute (ETSI).

API Overview

APIs, in general, encourage developers to write software by shielding them from the intricacies of each vendor's underlying hardware. And the one-size-fits-all approach to applications also benefits users, who are free to choose packages without worrying about whether they'll play with a particular device. Without APIs, individual applications typically work with only one vendor's products.

Key to CAPI Manager is its ability to support multiple applications and multiple boards in the same server (see the figure). Here's how it works: details of each board's ISDN capabilities are passed to the NLM's database when the drivers are initialised. Similarly, the details of each application are registered with the database at start-up. CAPI Manager uses all of this information to allocate ISDN resources.

For instance, when an application such as a fax server needs an ISDN connection, it sends a message to the NLM, which sends back a list of the boards that can handle the request. The application picks a board and sets up a fax call. In the reverse direction, CAPI Manager monitors incoming traffic and directs it to the appropriate application.

And according to Novell, that's just for starters. CAPI Manager is likely to stimulate a string of other ways of using ISDN equipment and services more efficiently, thus allowing even greater savings. AVM Computer-Systeme Vertriebs GmbH, Germany's largest ISDN board vendor, has already rolled out an ISDN enhancement to Novell's NetWare Connect that uses CAPI Manager. The AVM software lets users run standard communications packages on their PCs but route transmissions over the LAN to a shared ISDN board in the server. As a result, they don't need their own ISDN adaptors and ISDN lines.

At present, Novell plans to bundle CAPI manager into a future version of NetWare 4.X which will be sold on a worldwide basis. At present, six months of user evaluations are being planned before commercial products are launched.

Information Exchange

In essence, CAPI manager is an exchange mechanism that routes CAPI messages between applications and ISDN boards. CAPI itself defines a set of about 40 operating system-independent messages. These are used to set up and tear down calls and invoke higher-level ISDN services, such as packet switching. It also includes a driver interface spec that board vendors must implement to support applications that comply with the standard.

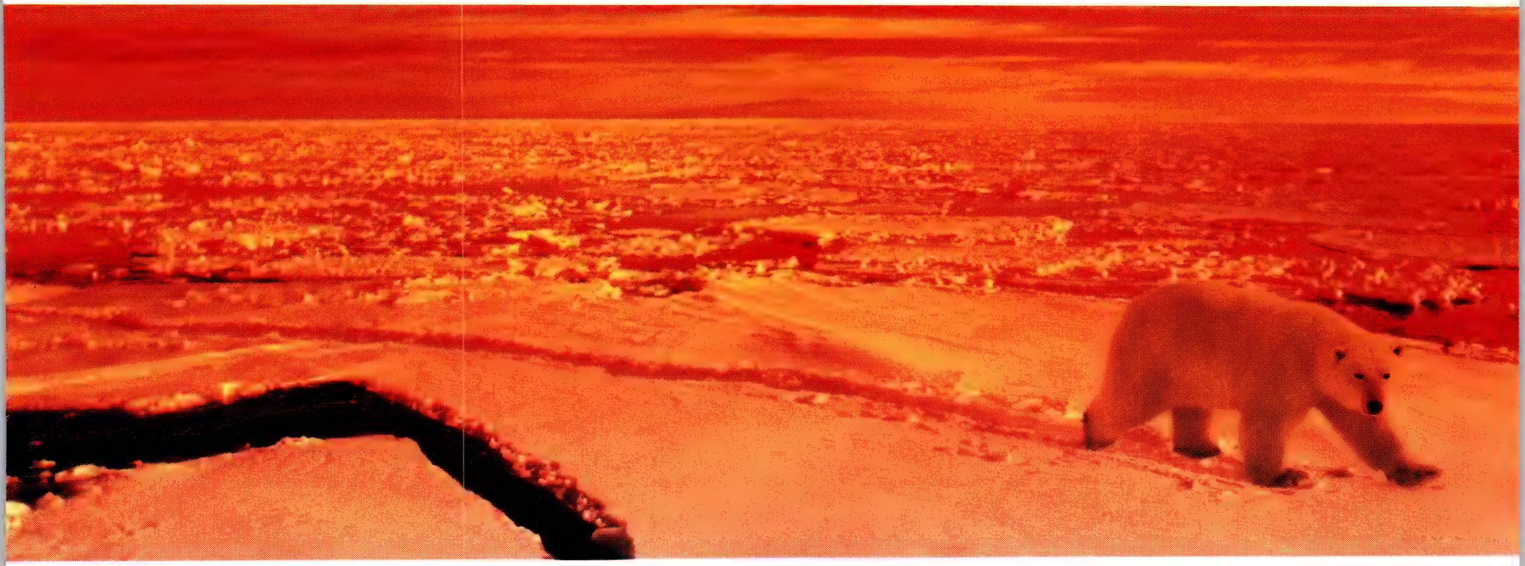
CAPI is defined by the CAPI Working Group. Members include major vendors such as Alcatel, Deutsche Bundespost Telekom, IBM, Microsoft, and Novell. The results of each meeting of the group are edited by AVM and published by Telekom Roland Eurolab, a subsidiary of Deutsche Telekom that operates a CAPI compliance testing facility.

CAPI Manager is the latest of several message-exchange mechanisms for various operating systems, including DOS, Windows and Unix. The NetWare mechanism was added at the end of 1993 and is incorporated in CAPI Version 2.0, which supports Euro-ISDN. CAPI 2.0 has been submitted to the ITU as a potential standard.

Novell's decision to adapt Germany's CAPI standard for use in NetWare environments makes a lot of sense but could prove controversial. CAPI is the only standard ISDN API to be widely implemented. It's been in use since 1989 and has helped make Germany a hotbed of ISDN technology. The country now boasts about 1.3 million active ISDN B Channels, and German vendors dominate the European ISDN board market, according to a survey from UK-

Continued on page 34

THE NATURAL CHOICE IN NETWORKING



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Network Design

The Client/Server Challenge: FDDI or Ethernet Switches?

Corporations claim they can't live without client/server computing. But net managers trying to link PCs and servers over Ethernet can't live with the congestion that's slowing things to a crawl on their networks.

Right now, they've got two possible cures for client/server overcrowding. The more familiar option offloads Ethernet by putting servers onto an FDDI ring and using bridge modules slotted into a chassis to tie LAN segments to the backbone. In this scenario, traffic flows back and forth between servers on the ring and stations on the LANs. The lesser-known alternative employs Ethernet switches to establish point-to-point connections between clients and servers.

According to a common wisdom, FDDI's 100Mbps bandwidth is the sure cure. But hands-on evaluations at European Network Laboratories (ENL) reveal that in some circumstances Ethernet-FDDI bridges can handle only 50Mbps before starting to exhibit heavy packet loss. In other words, these devices can halve effective throughput on an FDDI ring.

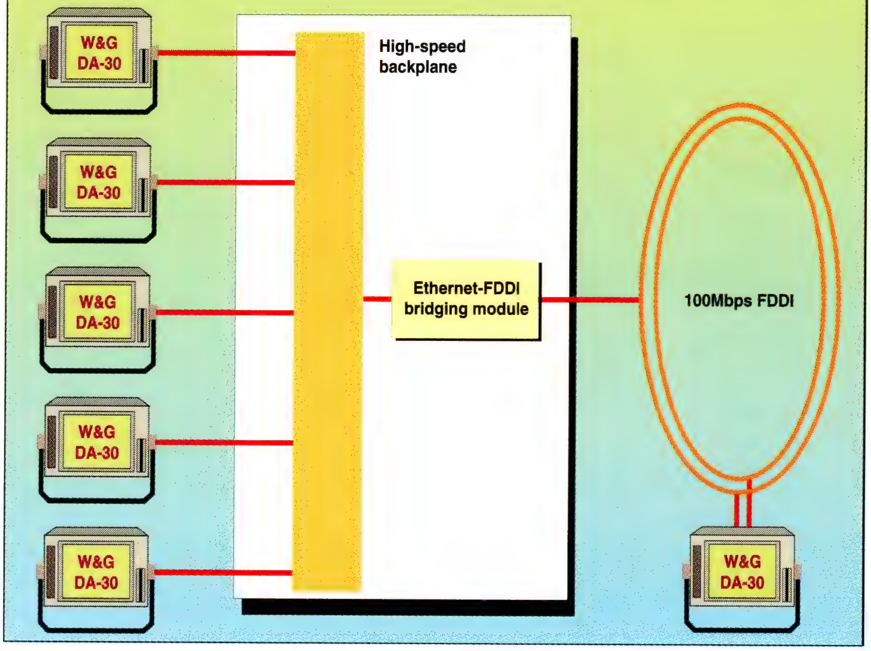
These findings contrast sharply with the results for the two Ethernet switches ENL tested, both of which hit full wire speed of 10Mbps on all ports.

But the choice here is not merely between 50Mbps and 10Mbps. Bandwidth on an FDDI ring is shared among the stations and servers attached to it. Since all traffic headed for the high-speed servers on the same ring will be throttled back to 50Mbps as it crosses the bridge, individual servers could end up starved for bandwidth. For example, if there were five servers on the ring — and all were active simultaneously — each might end up with no more than 10Mbps. Worse, there's no guarantee that available bandwidth will be shared equally, so a server could wind up with less than 10Mbps — once again slowing response times to unacceptable levels. And remember, available bandwidth drops in proportion to the number of servers on the ring.

In contrast, Ethernet switches deliver dedicated bandwidth. This means that a single switch could offer 10Mbps to a LAN server equipped with a single Ethernet adaptor card. If the same server were fitted with two, three, or four adaptors, then the switch could dedicate 20, 30, or 40Mbps to each of five servers equipped with multiple adaptors — four times the bandwidth available to the same servers on an FDDI ring. (It should be noted that ENL did not test this configuration, which would have required a 25-port switch. In its tests of 6-port switches, however, it was able to attain wire speed on all ports. Since these are hardware switches, performance is processor-independent and should not degrade as ports are added.)

Figure 1: The FDDI Test Bed

Five W&G DA-30s were used to generate steady streams of 64-byte IP frames at full wire speed over 10Mbps Ethernet segments linked through an Ethernet-FDDI bridge to a 100Mbps FDDI ring. The frames were directed to a single IP address on the ring and counted by another DA-30.



Design Decisions

ENL's findings shed light on the numbers network designers should really be working with when planning to upgrade their bandwidth-starved client/server networks.

Going with FDDI means that overall network performance will be limited by the throughput of the bridge used to link the ring to attached Ethernets. If traffic consists mostly of short frames — as is the case with the majority of networks running standard business applications — then expect to see bridges swamped once the 50Mbps mark is reached. If longer packets are the rule — as is the case when Unix workstations regularly perform extensive file transfers — then bridges should be able to match FDDI's full 100Mbps.

As indicated, Ethernet switches do not suffer from the same limitations. In fact, they can be counted on to work at wire speed — even when fielding compute-intensive short frames. And if network design decisions were made only on the basis of performance (as measured by frame loss), Ethernet switches would be the obvious choice.

But things aren't that simple. If a company is already heavily invested in FDDI, then it makes sense to go with bridges (and take the performance hit today) but be ready to move to ATM (asynchronous transfer mode) equipment when it starts shipping. Bear in mind that ATM traffic will travel over the same high-priced fibre now used by FDDI.

Network architects trying to decide between pulling fibre cable or installing LAN switches need to consider several other issues. FDDI is far better suited to campus networks, and it offers a degree of redundancy not matched by Ethernet. What's more, Ethernet switches only deliver a big boost in bandwidth if more than one adaptor card is slotted into a server, which can lead to problems with installation and configuration. Novell offers an NLM (Network Loadable Module) that allows multiple adaptors to be slotted into NetWare servers. That technology needs to be extended to other vendors' equipment.

Network managers who need to restrict access to certain segments or servers can achieve this end either with an Ethernet-FDDI bridge or with an Ethernet switch. The former is routing software that makes it simple to filter protocols. For instance, if users on one segment handle all the government contracts for an organisation, a router could be configured to restrict access to that local area network and its server. Ethernet switches, in contrast, can be used to define closed workgroups and access rights. But if a switched domain needs to be linked to a network, it will be necessary to install a router. And that router will be a bottleneck in the network.

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At this point, no switches exist that can link switched local area networks effectively. When it comes to the bottom line, however, Ethernet switches usually offer far better price/performance than FDDI. And switches are a first step to virtual LANs, the basic building blocks of ATM.

FDDI in Focus

FDDI, which received final approval from ANSI (American National Standards Institute) in 1988, was the first access method to make possible high throughput on LANs. Designed to offer 100Mbps over dual fibre rings, the Token Ring scheme has been shown to deliver 97.5Mbps at actual user sites. When deployed with diodes and multimode fibre, FDDI can be extended to more than one mile, which makes it a natural choice for campus networks. With lasers and monomode fibre, runs can reach more than 80km. What's more, fibre renders FDDI immune to the magnetic interference that wreaks havoc with copper wiring when it is installed in industrial sites. And thanks to its dual rings, FDDI furnishes a redundant path — good news for network managers looking to put mission-critical traffic on fibre backbones.

Despite these advantages, it took a long time for FDDI to capture much of the market — mainly because of the high cost of the optical components it relies on. Over the past four years, however, the price of FDDI equipment has dropped by around 60%, attracting a significant number of new users. And the price of fibre cabling has decreased 30% over the past two years. But even with this reduction, fibre remains often 8 to 10 times more expensive to deploy than copper.

FDDI has other drawbacks as well. As indicated, bandwidth must be shared among contending nodes. Further, as stations are added to a ring, it becomes virtually impossible to predict delays for asynchronous traffic. This makes the technology inappropriate for time-sensitive multimedia applications. And when synchronous traffic runs over FDDI, there are severe restrictions on the number of nodes allowed on a single ring.

The Switching Slant

Ethernet switches are not new: the first of this class of products was introduced by Kalpana early in 1990. But it was only last year that a significant number of vendors came to market with similar offerings. Most of the major hub vendors are investing heavily in this area and have announced Ethernet switches of their own.

In essence, all of these products rely on one of two switching technologies to boost Ethernet bandwidth over dedicated connections. Hardware switches use ASICs (application-specific integrated circuits) to reach wire speed without dropping frames — even under heavily loaded conditions. Software switches combine multiport bridging technology with high-speed RISC processors to achieve the same end.

Hardware switches have been shown to be faster than their software counterparts, but performance is not the only issue. They offer little or no filtering of bad frames. Software switches, in contrast, typically screen out all errored packets. What's more, they invariably combine Ethernet and FDDI in the same chassis, which suits them to service on the corporate backbone.

One of the major advantages of both types of switch is that they are compatible with standard Ethernet cards and cabling. Another significant benefit is that they make it easy to scale Ethernet bandwidth in multiples of 10Mbps by simply slotting a switching module into a chassis.

In order to determine which high-speed topology really has what it takes to alleviate client/server congestion, ENL set up two test beds that allowed it to compare the performance of FDDI and Ethernet switches. More specifically, the tests measured the bandwidth that each technology could deliver to the stations and servers on a LAN. All evaluations were carried out in conjunction with Electricité de France (EDF), the French national power authority.

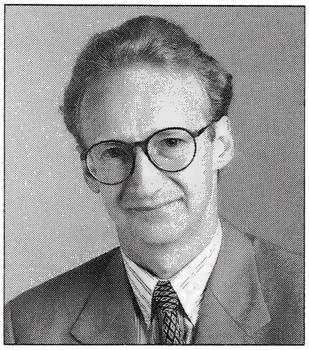
The Test Bed

The FDDI test bed comprised five 10Mbps Ethernet segments, an Ethernet-to-FDDI bridge, and a 100Mbps a FDDI ring. Five streams of 65-byte IP frames were generated at the full wire speed of 14,880 frames per second (fps) by five DA-30 generators from Wandel & Goltermann. The frames were directed to a single IP address on the ring and counted by another DA-30.

There are two ways to attach multiple Ethernets to an FDDI ring. The first requires a separate Ethernet-FDDI bridge for every segment — a costly, cumbersome approach to network design. The second scheme relies on a chassis to furnish a high-speed backplane that all the Ethernet traffic travels over. This way, a single Ethernet-FDDI bridge module can be slotted in to carry all the traffic from the bus onto the ring (see Figure 1 on page 28).

The second test bed was built around a six-port Ethernet switch. Three dual-port W&G DA-30s were used to generate a random pattern of 64-byte frames at wire speed between all of the ports. The same DA-30s were used to measure aggregate throughput (see Figure 2 on page 32).

ENL evaluated two Ethernet-to-FDDI bridges: The Backbone Concentrator Node from Wellfleet and the Elite Switching hub ES/1 from SMC. According to their respective vendors, the BCN is a router and the ES/1 is a switching hub. Both were configured as bridges. Test results reveal that the BCN delivers a maximum of 49Mbps when streams of 64-byte frames were sent from multiple Ethernet segments onto the



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FDDI ring. It dropped 3% of the frames. The ES/1 peaked at 47Mbps and exhibited a frame loss of 5% under full load.

These results tend to corroborate Wellfleet's claim that its bridging module can forward just over 80,000 fps. If 140-byte frames are being forwarded, the bridge will be able to sustain a throughput of 90Mbps. If 64-byte frames are being handled, a simple calculation shows that throughput drops by slightly more than half — as the test demonstrated. Further, SMC has recently announced an intelligent Ethernet-FDDI bridge that it claims breaks the 100,000fps barrier. This translates into a throughput of 60Mbps. ENL has not had a chance to evaluate this new module.

Admittedly, steady streams of 64-byte frames do not represent the sort of traffic fond on the typical Ethernet. That's exactly the point: stress-testing these devices in this way indicates how they will perform on Ethernets that are stretched to maximum capacity. What's more, studies show that 60% to 70% of the frames on today's Ethernet are 64 bytes long; many of these short frames are acknowledgments.

Hardware in a Hurry

ENL also tested two hardware Ethernet switches — the Etherswitch from Kalpana and the LET-36 from Lannet Data Communications. Both were able to hit full wire speed without showing any signs of frame loss. The same results were achieved when random streams of traffic were applied across the switched ports.

Further, the aggregate bandwidth offered by an Ethernet switch is in direct proportion to the number of ports the chassis can accommodate. Theoretically, the Etherswitch should be able to deliver an aggregate bandwidth of 150Mbps to its 15 ports. The LET-36 should be able to deliver a total of 1.28Gbps to its 128 ports. ENL only tested these switches in a 6-port configuration.

As discussed, network design decisions can't be made purely in terms of performance. Price is almost always a factor in any IT purchase. In very general terms, Ethernet switches look to be the better buy. ENL priced out a five-server configuration and found switched schemes to be considerably less expensive than their Ethernet-FDDI counterparts, although pricing can vary significantly according to specific requirements and connectivity options.

Going with FDDI means shelling out for either a BCN router or an ES/1 switching hub, Ethernet modules (one per segment), and an Ethernet-FDDI bridge, as well as optical adaptors (one per server).

Cheaper Option

But what about Ethernet switches? On the whole, this solution works out considerably cheaper. Both the Kalpana and the Lannet products work with conventional Ethernet adaptors, making them far cheaper than FDDI cards. And, as noted Ethernet's copper cabling is about one-eighth the price of FDDI fibre.

To get a sense for how it all adds up, consider a network of five Ethernet segments and five servers. SMC's FDDI solution requires a 5-slot ES/1, two 4-port switched Ethernet modules, an Ethernet-FDDI bridge module, and five FDDI adaptors, one for each server. And because of the performance limitation of Ethernet-FDDI bridges, aggregate bandwidth on the ring could drop as low as 50Mbps if traffic consists mainly of small frames.

With Wellfleet, the 4-slot Backbone Link Node could do the same job. Once again, two 4-port Ethernet modules are needed, together with an Ethernet-FDDI bridging module and five FDDI adaptors. And the 50Mbps restriction applies here as well. (It should be noted that the five-server configuration penalises SMC and Wellfleet because a second Ethernet module is needed even though only one of its ports is used. With four or fewer servers, a single module could be used.)

And what about the switched Ethernet schemes? A single 15-slot Kalpana Etherswitch could accommodate five LAN segments and five servers. Using 2 Ethernet adaptors in every server makes it possible to dedicate 20Mbps to each (calling for 10 adaptors). This approach requires an Ethernet module in every one of the Etherswitch's 15-slots (five for the LAN segments and 10 for the servers). Remember, though that if this switched domain needs to be tied into an enterprise network, then a router will be required.

Lannet's 5-slot LET-10 also could be used. Two 8-port LSE-808 Ethernet modules are all that's needed to handle five LAN segments and five servers, each fitted with 2 adaptor cards. Thus, Lannet can pump 20Mbps of dedicated bandwidth to each of five servers — but again, a router will be needed if connectivity is required to the enterprise. On the whole, the switched Ethernet schemes come out way ahead in terms of cost.

Different Approaches

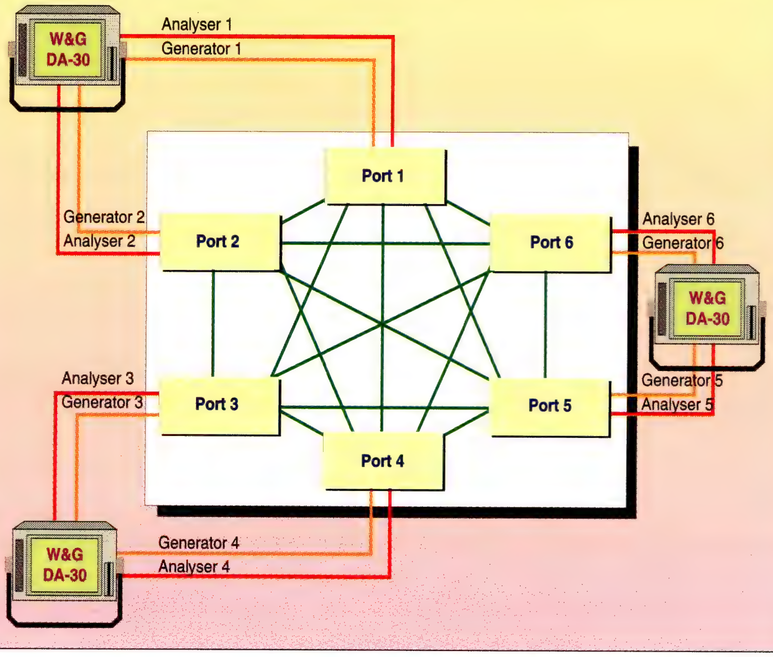
But in the end, the choice of bridge versus switch is really a choice between two design philosophies. Bridges, by definition, are used to divide LANs into segments — fixed domains of end-users and resources. And segmentation, if carried to its logical extreme, is a self-defeating exercise. For a network to function efficiently, all of those neatly separated segments must ultimately be brought together with the same unwieldy technology used to segregate them in the first place.

Switches, in contrast, establish point-to-point connections between end-users. That, in turn, gives network managers a simple way to move users and resources freely among domains. This sort of on-the-fly network management is the first step towards the sort of any-to-any connectivity that is the promise of ATM.

Robert Mandeville

Figure 2: The Ethernet Switch Test Bed

Built around a six port Ethernet switch, the Ethernet switch test bed used three dual-port W&G DA-30s to generate a random pattern of 64-byte frames at wire speed between all ports. The same DA-30s were used to measure aggregate throughput.



Technology Update

SCI Adaptor Breaks Gbps Barrier

US vendor Dolphin Interconnect Solutions has released its new Sbus-SCI adaptor, the first-ever product to implement the previously little known Scalable Coherent Interface (SCI) standard. Dolphin says SCI (officially known as ANSI/IEEE SCI 1596-1992) has two important features. Firstly, it runs at 1Gbps, almost four times faster than the next fastest LAN technology on the market, Fibre Channel, and over six times faster than ATM. Secondly, the technology reputedly has very low latency, with Dolphin officials claiming that internode delay can be as low as 0.5 microseconds. Fibre Channel can only manage 10-microsecond delays, and ATM is even slower. The Sbus-SCI adaptor comes with a SunOS Unix device driver and a TCP/IP interface, and Dolphin is currently at work on an SCI switch with an ATM uplink, due for release in 1995. Dolphin said the SCI adaptors are suitable for use in applications such as processor clustering, workstation clustering, and I/O clustering. However, these markets are still in their infancy, which may explain why other vendors haven't rushed to embrace the technology, even though it has been a ratified standard since 1992.

Intel to Launch 'Cable' Computing

Intel has signed agreements with a number of US firms to deliver new interactive services for PCs to the home via cable. The services, which will encompass multimedia on-line services and Internet access, are due to be tested on selected cable systems in the US shortly. Intel has also announced it is working with several companies to provide a range of cable-delivered services, from multimedia encyclopedias, on-line shopping, news-on-demand and multimedia movie kits, to specialised PC programming. Meanwhile, Intel has announced an R&D project with Hewlett-Packard aimed at providing advanced technologies for 'end-of-the-decade' workstation, server and enterprise computing products, which will encompass 64-bit microprocessor designs, semiconductor processes and software optimisation.

UB-Fujitsu ATM Partnership

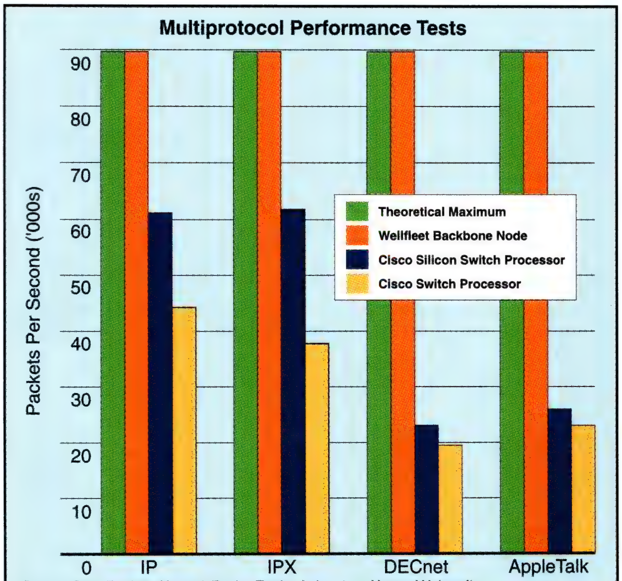
Hot on the heels of its recently announced 'ATM/Anywhere' strategy, UB Networks has revealed details of a new partnership with Fujitsu Microelectronics to bring low-priced ATM solutions to the desktop. The companies have worked together to develop a complete line of ATM integrated circuits, and those chips will now find their way into UB's new Access/ATM GeoSwitch 155 product line. UB's ATM/Anywhere strategy aims to drive per-port ATM pricing down to levels comparable with switched Ethernet network solutions.

OSPF Proves Its Mettle

Open Shortest Path First (OSPF), the communications protocol used between routers from different vendors, has come through with flying colours in an interoperability test conducted recently by the OSPF Interoperability Group (OIG). The test involved routers from 12 different vendors in a simulated network comprising over 200 routers, and achieved a convergence time of 15 seconds. The OIG said that while this interval would be considered fairly slow for a real-life operational network, it is reasonable when the number of different devices is taken into account. The test proved conclusively that OSPF implementations from different vendors can co-exist. Participating vendors were ACC, Ascom Timeplex, Cisco, DEC, HP, IBM, Network Systems Corporation, Novell, Proteon, Retix, 3Com and Wellfleet.

Low-Speed ATM Work Continues

Despite the fact that the ATM Forum has decided to abandon plans to develop standards for a low-speed 25Mbps version of the technology, several vendors are still plugging away at their own proprietary versions. IBM has already announced the availability of its 25Mbps ATM chip set, while Danish vendor Olicom has announced it has joined IBM's 25Mbps ATM consortium and that it is also working with Fujitsu on a second chip set. 25Mbps ATM adaptors and switches are expected to start appearing on the market later in the year. Champions of the technology say it has a number of advantages. For a start, it should work over the plain old Category 3 cabling many users already have installed. It should also be cheap, because the chip sets are based on the same silicon already used in IBM and Olicom Token Ring products, the only difference being the line encoding.



Source: Scott Bradner, Network Device Testing Laboratory, Harvard University (as released by Wellfleet Communications)

Microsoft's Tiger Set to Roar

Microsoft has introduced the architecture for a new fully scalable media file server solution. Code-named Tiger, the software will deliver services such as video-on-demand, with the company saying it plans to trial such a service in Australia sometime next year. The Tiger software has been designed to be hardware independent, and will use components such as microprocessors and ATM switches. Intel and Compaq have demonstrated continuous media servers based on the Tiger technology.

Wellfleet Claims Top Performance

The latest round of tests carried out by Scott Bradner of the Harvard Network Device Test Lab have shown Wellfleet routers to be the top performers, boasting both very high throughput and zero packet loss, according to Wellfleet officials. The tests compared products from Proteon, Wellfleet, Cisco and Retix, and measured performance of routers configured in a collapsed backbone architecture supporting IP, DECnet, IPX, AppleTalk and bridge protocols. Wellfleet's Backbone Node was able to move data at full wire speed in the 6-stream Ethernet-to-Ethernet test using 64-byte packets (see graph). Wellfleet officials said this is an important test because it demonstrates how products fare in heterogeneous environments where many different protocols exist.

3Com, Novell Extend Alliance

A new partnership between former arch-rivals 3Com and Novell will see 3Com integrate its Transcend family of network management products with Novell's NetWare Distributed Management Services (NDMS) environment. Additionally, 3Com will support NetWare Link Services Protocol (NLSP) in its NetBuilder bridges and routers, and Novell will incorporate 3Com's Boundary Routing system architecture in its NetWare MultiProtocol Router Plus products.

ISDN from page 26

based market researcher Dataquest Europe. But Novell's backing of CAPI could give German manufacturers a commercial advantage, even though adaptor vendors in many other countries have implemented CAPI drivers in order to crack the German market.

And CAPI Manager is only as good as the CAPI standard, which may not address key networking issues. Some vendors claim CAPI doesn't support security schemes within PPP (point-to-point protocol) at present. Specifically, users can't set passwords when using PPP. Novell says that the workaround is to invoke security measures in higher protocols.

Microsoft's TAPI is aimed at a very different market. The high-level API is intended to serve as the basis for a whole new era of applications that integrate PCs and telecommunication services. Microsoft's main focus is on the desktop, especially conferencing. TAPI gives software developers a set of commands that can be used to set up and tear down ISDN calls and access other services. For example, an application that incorporates this command set and runs under Windows would make it possible to link with other PCs via phone lines. TAPI also could be used to write software that lets a PC function as an answering machine, monitoring calls and storing messages, and could serve as the basis of an application that adds voice annotation to text via the phone.

Vendor Interest

A number of ISDN board vendors are developing TAPI drivers, including ISDN System Corporation, Link Technology, Oxus Research S.A., and Teleint GmbH. Other vendors are sceptical, indicating that most users want to retrofit ISDN to applications now running on modem networks or LANs. Thus, they're more interested in supporting the APIs already in use on such networks — the AT Command Set from Hayes Microcomputer Products, Novell's ODI (Open Data-link Interface), and Microsoft's NDIS (Network Driver Interface Specification).

According to AVM's General Manager, Johannes Nill, modem or LAN interfaces are not a good match for ISDN. Since modems operate at Layer 1 of the OSI model, a modem interface can't take advantage of ISDN features in Layers 2 and 3 — such as voice telephony, packet switching, and rate adaptation. Moreover, modems use serial lines, presenting a 'massive bottleneck' for traffic at ISDN speeds.

Nill points out that LAN interfaces are designed for connectionless environments. If they're used with ISDN, they automate the process of setting up and tearing down calls. That's fine if the automation works. But if there's trouble, there's no way for users to set up and tear down calls themselves.

Ironically, CAPI may be the answer to some of these problems. Vendors only need to write a small amount of software to extend CAPI so that it will support existing LAN applications and give users an additional mechanism for setting up ISDN calls. Some German vendors already offer software that enables their CAPI boards to work with ODI applications. The same approach promises to support TAPI, enabling users to buy an ISDN board now for all applications — past, present, and future.

Peter Heywood

Services

AT&T's Novell Network Nexus

With the recent US announcement of AT&T NetWare Connect Services, the company is set to add itself to a growing number of telecom providers and software companies helping wide area networks muscle into territory presently dominated by LANs.

AT&T NetWare Connect Services is the product of a co-operative venture between AT&T and Novell (with some help also from Lotus), and is envisioned as a global network of business networks.

The network will support connections over both TCP/IP and Novell's IPX protocols. Services will include information retrieval, workgroup collaboration, electronic commerce, messaging, and distributed computing. AT&T plans to distribute client/server applications over the network, and US users will be able to access AT&T public data services such as Network Notes, (a Lotus Notes application), AT&T's Easylink messaging service, and applications available on the Internet, making the new service well suited to form the basis for numerous electronic commerce applications.

By utilising the three companies' directory services and internetworking technology, the NetWare Connect Services provides seamless NetWare connectivity support through the IPX protocol. Running any NLM (NetWare Loadable Module) application like Notes, the service will connect users into a public data network designed specifically for NetWare users who want to communicate over wide areas.

Based on frame relay, the new network is intended to provide network managers with an attractive alternative to private networks, because it will be cheaper to set up and easier to manage. Though AT&T has not yet finalised pricing for the service, the distribution of Notes over NetWare Connect Services will supposedly be more affordable because companies will not have to employ staff for network administration.

US users can access the new AT&T/Novell network by establishing a dedicated or dial-up connection with all of their company's remote offices through an AT&T network entry point — like AT&T's InterSpan or EasyLink services. Each remote site is equipped with a NetWare server that then acts as a gateway to other NetWare users that are also dialled into the servers.

AT&T NetWare Connect Services may be of particular benefit to companies who are involved in a large amount of contract work, and need to work very closely with other firms for a limited period of time. Communicating with each other via Notes over AT&T's NetWare Connect Services, the companies can simply terminate the link as soon as their business is concluded.

Besides information and application distribution specifically targeted to extending enterprise applications over public networks, the AT&T service will include telecommuting tools which, through high-speed dial-up access, employees can access their company's local area networks from their PCs at home.

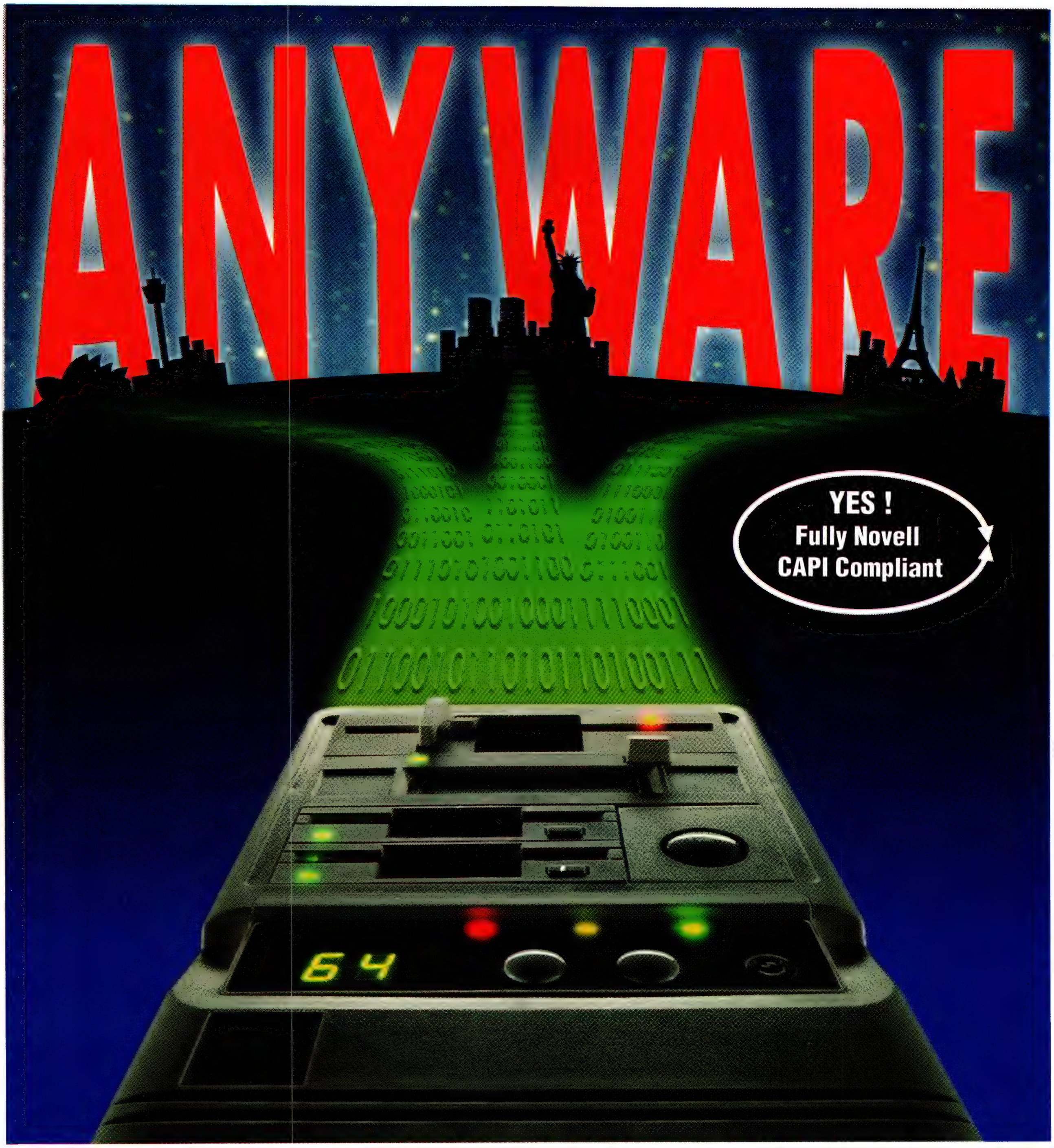
"Information distribution will be available immediately, as will telecommuting. Over time, someone will be able to sell and distribute software," said AT&T spokesperson Marni Ehrich, who said that independent software vendors will be responsible for writing many of the applications that will be available on the service.

The new service is scheduled to be tested at beta sites throughout this year, and the service will be bundled with NetWare in the first quarter of 1995. A second standalone version without NetWare is due to arrive on the market a few months later. AT&T is yet to address the issue of pricing.

The first commercial implementation of the information superhighway (according to the PR hype), AT&T NetWare Connect Services is likely to soon have considerable competition. The Aberdeen Group predicts that the market for this kind of service will build rapidly over the next five years. Currently, client/server applications on a local level represent 5% of all data traffic over networks, with prediction client/server applications will increase to 25% within the next five years.

With rumors that MCI Communications is planning a similar service, Network Notes faces stiff competition even now — a full year before its planned implementation. Texas-based Wolf Communications presently offers access to its public Notes databases through its WorldCom public Notes network, and CompuServe has offered a public Notes service for the past year. The latter allows subscribers to receive Internet messages in a Notes-formatted database.

Brian Riggs



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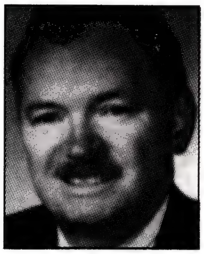
Microsoft Sets Its Sights on Faxmail



James Rafferty

One way to gauge whether a new technology has the right stuff is to keep an eye on the companies that back it. By that measure, the emerging faxmail product class looks like a solid bet to succeed.

Microsoft, the PC software industry's top gun, is making a determined effort to steer the development of faxmail. The linchpin to Microsoft's effort is Microsoft At Work, which includes a new messaging protocol that offers a simple and direct way to exchange files and messages over the public dial-up network.

Microsoft isn't the only vendor eyeing leadership in the faxmail market. Several key members of the International Computer Fax Association are backing faxmail based on standards recently approved by the International Telecommunication Union (ITU).

As the name suggests, faxmail is envisioned as a hybrid that extends e-mail functions to anyone with a suitably equipped Group 3 facsimile machine or fax modem. The idea is to make an e-mail exchange as easy as sending a fax document, eliminating the need for cumbersome and costly gateways and third-party messaging services. Using binary files rather than bit-mapped images also allows recipients to edit and alter documents electronically.

Several makers of Group 3 fax boards, such as Gammalink and Intel, have offered features like binary file exchange for some time. But those offerings are based on proprietary technology, eliminating the possibility of cross-vendor interoperability. Microsoft is pushing At Work as an industry standard and has already won the endorsement of several makers of fax hardware and software.

Microsoft's offering amounts to a value-added alternative to the ITU's T.434 binary file transfer (BFT) recommendation, ratified in 1992 as an add-on to the Group 3 fax standard. Although At Work messaging and T.434 are based on similar technology, At Work contains many features that the ITU has yet to address. The ITU-T study group responsible for T.434 isn't expected to approve a similar set of features until 1995 or 1996.

Work on the BFT specification began back in 1988, after the ITU-T (then known as the CCITT) added the Group 3 error correction mode (ECM) spec to its T.4 and T.30 facsimile protocol recommendations. ECM ensures error-free fax transmissions; before its arrival, Group 3 fax lacked an error-free delivery mechanism, making it unsuitable for carrying binary files.

> *"[Faxmail's] main attractions are exactly what has made Group 3 fax so popular — ease of use, unattended operation, instant delivery, and virtually guaranteed, compatibility."*

Once ECM became available, fax board makers like Gammalink and Intel began adding proprietary file exchange capabilities to their products, under the Group 3 non-standard facilities (NSF) provisions. Meanwhile, several vendors banded together to develop a standard approach for binary file exchanges via Group 3 fax. This group, which became the Telecommunications Industry Association (TIA) TR-29.1 committee, developed the BFT spec. The CCITT approved the spec as the T.434 recommendation in 1992.

T.434 is one of several ITU-T recommendations aimed at integrating Group 3 fax standards into the corporate networking model. For instance, the ITU-T Study Group 8 and the TIA TR-29 committee are now putting the final touches on a Group 3 extension that enables fax transmissions to be routed to recipients on LANs.

Although the ITU approved T.434 BFT in 1992, the recommendation is just now being implemented by fax vendors, slowing the transition to the next generation of fax devices. Enter Microsoft, which late last year unveiled its first At Work-equipped offering, Windows for Workgroups 3.11. The At Work protocol is based on the ITU-T's ECM recommendation, but also includes a range of proprietary extensions that make it different from T.434 BFT.

Under the At Work approach, all communications are handled through the same user interface, which means the distinction between e-mail, fax, and binary file transfer virtually disappears. Users can keep all e-mail addresses and fax phone numbers in a single address directory. Among the At Work features not included in the current ITU-T recommendations are RSA encryption to ensure message security and digital signatures to authenticate sender identity. Although the ITU-T is considering such extensions for its Group 3 standard, approval is not likely until 1995 or 1996.

By going its own way, Microsoft has been able to overcome some other limitations of the ITU-T standards suite. For example, At Work allows two devices to negotiate parameters based on the hard copy capabilities of the receiving device. It also addresses the fax routing problem still being worked on by the ITU-T by including an e-mail address along with a given transmission. This address information can be used to reach the desired user or a distribution list of users on a LAN or e-mail system. Microsoft has promised it will include the At Work messaging protocol in all future versions of its operating systems. Meanwhile, several third-party suppliers are slated to begin shipping At Work-compatible products.

Of course, as other vendors release products that conform to the ITU-T recommendations, the potential exists for interoperability problems. Technically, interoperability between At Work and T.434 BFT certainly is possible. Both use ECM, and both are coded using Abstract Syntax Notation No. 1. However, the use of T.434 BFT is negotiated as a standard fax feature, but the At Work protocol relies on NSF for its negotiations. Many fax software vendors are likely to deal with the interoperability issue by supporting both faxmail types. But convergence of the two standards would be in the best interests of users.

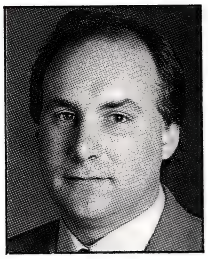
Another implementation issue is that most Group 3 fax machines and fax modems are not equipped to handle ECM, which means they can't be used for either T.434 or At Work messaging. Vendors say they are now working to correct this problem via software enhancements and firmware upgrades.

Although faxmail is sure to have some growing pains, it stands a good chance of serving as the next-generation fax technology. It's main attractions are exactly what has made Group 3 fax so widely popular — ease of use, unattended operation, instant delivery, and virtually guaranteed compatibility. Faxmail won't replace conventional e-mail systems, but it offers a way to extend communications to remote users and those with incompatible e-mail systems.

James Rafferty is President of Connecticut-based Human Communications, a consultancy which specialises in telecommunications and software development.

LAN VIEWS

ATM: An Order for Magnitude



Graeme Le Roux

Industry hype aside, it seems, at present, that in around 12 to 18 months a sufficient sub-set of ATM standards will have been set in concrete to allow vendors to produce mature first generation products permitting the interconnection of hubs. This interconnection will permit administrators to set up static paths between hubs through an ATM switch fabric of reasonably arbitrary topography and thus, with the aid of switched Ethernet, Token Ring, FDDI, etc. establish, reconfigure and de-install virtual workgroups and networks at will from a single management station. Now we've all heard this before; however this time the promise will in all probability be fulfilled. ATM's ability to carry multiple channels of various bandwidths with fixed latency is the last piece of the technological jigsaw puzzle which is required to make this administrator's dream a reality. Unfortunately, as is often the case with changing network standards, solving one set of problems creates another.

To take a TCP/IP example; consider a single site which houses a company with several departments. Classically each department would be physically housed in a single area. Each department would be assigned a single IP subnet address and the subnets would be interconnected via routers. If a department expands from, say, the top floor of the building to the top floor plus half the bottom floor as well then, in order to avoid a potentially complex re-configuration of IP addresses and route tables, a second backbone must be run from the top floor to the bottom floor. By using switching hubs on each floor the top floor's IP subnet is extended to the bottom floor. This is known as a virtual network. If the hubs are connected via ATM then an administrator can simply establish a new virtual circuit within the ATM switch fabric rather than having to physically pull a new piece of cable. Problem solved. So what happens when the head of the department says 'Thanks, when can we connect the interstate office?' The answer, at this stage, is regrettably; how long is a piece of string?

The problem is quite literally one of magnitude — none for ATM and too little for leased lines. In order to create a virtual network between two sites you will have two choices; to interconnect the two halves (one at each site) of your IP subnet via a standard remote bridge which will be connected to your ATM-capable hub at each site (i.e. one bridged connection per subnet) or to use a leased line between two dedicated ATM switches. The reason for this is that there is, as yet, no public ATM service in Australia and therefore no direct ATM interface to which your ATM capable hubs can connect. Your second option — that of a leased line connecting private ATM switches — is effectively stymied by the inability of Australia's (and most of the rest of the world's) telcos to supply anything like the bandwidth you will need at anything like a price you could afford.

"In short, [when planning for ATM] get the small details right, or the resulting mess will be much more than the sum of the component parts."

Minimum ATM bandwidth proposals — those intended for connecting workstations to local hubs — are 20Mbps or more and the bandwidths proposed for the interconnection of hubs, servers, etc. are 155Mbps and 620Mbps. Some vendors have announced, made provision for, or are in the process of shipping SONET/SDH interfaces which are capable of these speeds and can be upgraded to run at several gigabits/second over, in most cases, the same media. If this seems like a lot of bandwidth remember that a virtual network of the sort discussed above will carry every data packet, broadcast and collision across the WAN link and therefore in an ATM-to-ATM environment the virtual circuit required will be 10Mbps for Ethernet, 16Mbps for Token Ring, etc. — 620Mbps will therefore support just 62 IP subnets in an Ethernet environment. A single class 'B' IP address will support 254 subnets using a common 8-8 split. If half these subnets are deployed as virtual networks 1.28Gbps (assuming Ethernet) will be required. If ATM takes off on the timetable which vendors predict, or even at a much more conservative rate, it would seem that there might be a market for dark fibre by 1997 when people other than Telecom and Optus will be able to buy licences to dig trenches across the country.

So much for 'might-be' what do you do now to limit, if not avoid, this type of headache? The most obvious action is to prepare those who use the network for which you are responsible to face the real limitations of first generation ATM technology. Make sure that managers who may be making business plans for the next few years ahead understand the practical limits within which you will most probably have to work.

On the technical side, lay fibre backbones, which may be upgraded to support gigabit/second bandwidths, whenever possible, particularly in campus environments. If separate offices are within line-of-sight consider the possibility of using microwave links. In either case consider the deployment of devices such as frame/cell switches — e.g. Nortel's Magellan Passport — to provide a carrier backbone network and the integration of voice, fax, data and, if you have it, video (this includes security video systems) to make the use of such devices more cost effective.

Wherever possible, design new business systems to use architectures, such as client/server, which generate as little network traffic as possible. Use LAN protocols which use some form of domain name service rather than broadcasts to locate network resources or resolve network names and addresses.

Perhaps the most important, and the most basic, preparation for a transition to ATM is to go over your network with a fine tooth comb; simplify it as much as you can. Try to eliminate disparate media types, older cable runs, UTP cable and patch panels which are not Category 5 compatible, and older transmission system elements such as hubs which do not support switched Ethernet and/or may not be compatible with future ATM releases. Find out what statistics are available from the devices on your LAN, retrieve them and analyse them carefully with a view towards identifying and eliminating present and future bottlenecks. If your network is reasonably heavily loaded look at deploying switched media — Ethernet, Token Ring, etc. In short, get the small details right now, or the resulting mess will be much more than the sum of the component parts. Above all, remember my advice of last October on the hype surrounding ATM: if somebody offers to sell you a pretty new parrot — check the perch for nails.

Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.

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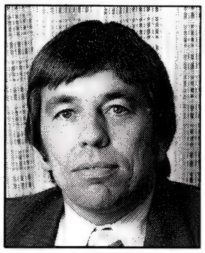

Alan Lloyd

In last month's edition, Gerard Joseph from IBM eloquently commented on the views I've expressed in this column in recent months on the relative merits of the OSI and IP protocol suites (see 'Balance Needed in Internet/GOSIP Debate' starting on page 8). As Gerard's letter attests, I have obviously stirred the pot a little on this issue and perhaps my views about this are a bit OSI-oriented to say the least!

I will address Gerard's points in turn but I would first like to restate my unwavering belief in the value of international standards — a belief shared in theory if not always in practice by many multinational vendors. Why is it that organisations which have been supporting the OSI process for years still seem to have difficulty with the implementation of international standards, or in fact say there are deficiencies in them? One could well ask that if they are that deficient how have these standards reached international status under the support of these organisations?

Yes, perhaps some standards are complex and certainly Virtual Terminal was considered 'late' but this is because the majority of ancient terminal systems have died out. But honestly, with all the millions of dollars that have gone into developing a few OSI standards such as FTAM, VT, X.400, X.500, X.700, etc., isn't it strange that the might of the multinational IT companies (which voted *Yes* to their status) still have problems delivering? If these standards are not widely available the problem is not one of technical complexity. Do people believe that FTAM is more complex than a relational database? Do people believe that OSI 'in all its bloated glory' is more complex than SNA? Do people honestly believe that CLNP as an internetworking protocol is so complex to implement that it needs a 100 people in the same room for over 8 years? Could the reluctance to implement OSI be related to market positioning?

This debate does little for the users of technology, who want vendor-independent, internationally agreed scaleable communications (OSI). But the unfortunate fact of life is that we have three ranges of communications standards namely: proprietary, de facto and OSI. Each standard type has its own addressing scheme and administration procedures, therefore talking about protocol 'integration' as a magic cure to the problem is nothing more than lip service to a physical impossibility. Yes, protocol gateways are possible; yes, protocol mapping is possible; yes, protocol tunnelling is possible, but *integration*? How do you combine two protocols with disparate addressing schemes, especially when one has a globally defined address?

"These sorts of debates I feel serve one purpose. They create a concept that cannot be realised, confuse the network designers of commercial organisations and deliberately delay the adoption of true international standards."

These sorts of debates I feel serve one purpose. They create a concept that cannot be realised, confuse the network designers of commercial organisations and deliberately delay the adoption of true international standards.

Gerard's comments in last month's edition under the guise of 'a balanced view' also represent the confused way in which 'OSI' is debated to its disadvantage. After all, OSI is only a seven layer framework for developing standards. Even one of the new protocols from IBM is referred to as a 'Transport' protocol. So why is OSI being maligned?

Gerard states that I saw the United States FIRP (Federal Internetworking Requirements Panel) report as an attack on OSI. Perhaps the continual public bagging of OSI has made many people, including those in the US who are working hard trying to provide the world with vendor-independent standards, a little sensitive. With respect to the FIRP report being considered an 'attack' on OSI, I was by no means alone. The report was seen by many people across the world as the United States trying to protect its own technology. It was seen as a trade issue and in violation of the GATT agreements. It was seen as a way of stemming the downturn in the US IT industry due to international standardisation. It was seen as a way to legitimise the fact that US has so far been slow to adopt OSI standards. It was also seen as the road to chaos for US infrastructure builders, a road which would create immense difficulty for those designing large scale networks in that country. And many of those critical were, I might add, from the US.

The FIRP report, for all its nice words, was seen as not being about the technicalities of any particular standard, it was seen as the US trying to control the progress of 'open' technologies to its advantage. In the closing part of Gerard's response the word 'convergence' is used. Does this mean that international standards must be readjusted to suit US de facto technologies? Why? Would the same adjustment occur for the UK, Australia, Japan, Germany if they had the same issue?

I would like to address some of Gerard's specific comments (which I've summarised for the sake of brevity):

OSI's noticeable drawbacks include several different NSAP address formats and two mutually incompatible network-layer services (connectionless and connection-mode).

These drawbacks of course were put into the standards deliberately! I think the best thing here is to explain the difference between network dependent protocols and network independent protocols (and their addressing schemes) and the concept of internetworking.

X.25, ISDN and Telex are dependent network protocols simply because they are discrete types of networking technologies. CLNP is a network independent protocol that can be used as an internetworking protocol over one or more underlying dependent network protocols. This internetworking protocol provides a uniform connectionless network service interface to the transport user over a range of underlying network(s). It's that simple!

The addressing schemes used by the internetworking protocol (CLNP NSAPs) can be either independent (i.e. based on authorities and logical routing domains as per the Aviation NSAP standard which has to address aircraft) or dependent. In the former case, this independent NSAP is mapped via route mapping tables to the dependent protocols at the point of access to each specific type of network when the CLNP is transmitted over the specific protocol. In the latter case of a single type of underlying network (e.g. X.25), CLNP can be used with a network dependent NSAP, namely an X.25 (X.121) address form. That is why the address options are provided; i.e. a consistent internetworking service over one or more underlying network dependent protocols. Note all NSAP address types are globally administered.

The connection-oriented/connectionless debate is also straightforward. Internetworking protocols are connectionless because they do not have any notion of the underlying network resources used. So why or how can they set up a 'connection' (whose purpose is in fact to allocate an underlying switching resource) when it (the internetworking protocol) by definition does not know what the underlying resource is! In this case the connection mechanism for the underlying dependent network is a 'mechanism' embedded within the network layer and is implementation defined. Connection-oriented network *services* are provided so they can map transport protocols directly onto connection-oriented network dependent protocols such as ISDN or X.25.

Hopefully this explanation demonstrates the rationale for the options in NSAP formats, the connection-oriented vs connectionless modes and the issue of internetworking and dependent networking. I think the above text just demonstrates the advantages, flexibility and consistency applied to OSI's networking and internetworking design. I just get very concerned why these simple concepts and so few bytes cause so much confusion! (Note: CLNP has been a standard for nearly a decade!)

OSI is not X.25 or 8802.x.

Comments of this nature only confuse the debate. These standards are aligned to the OSI reference model and explicitly refer to Link, Network and Logical Link (as defined in ISO 7498 and X.200 — the OSI reference model). This issue of quoting OSI and 'predated' standards is another meaningless smokescreen to put OSI down.

OSI is a framework and naturally accommodates a wide range of standards. OSI was not devised as a something that would obsolete the 'predated' protocols as that would serve no point. The point raised seems to be that if OSI embraces predated standards, OSI must deficient or does not count. I suppose the opposite negative argument could be applied as well. If OSI happened to exclude predated standards then it would have not been accepted. I could also ask why IBM spent so much money on brochures which showed the bottom of SNA mapping to lower layers of OSI if OSI only relates to the 'top four and a half (or so) layers'! Gerard also seems to imply that because the bottom layers of OSI have solidified with a range of networking standards that does not count as any credit to the OSI framework. It is odd that Gerard says that X.25 is not an OSI standard in one paragraph, yet it becomes one in subsequent paragraphs.

When people talk of OSI they only refer to the top four and a half layers of the stack.

Strange. When I talk about my car I usually refer to all of it! I do the same with OSI. Yet again, the technique seems to be to minimise the scope and benefits of OSI and say there are only a few things (X.400, X.500, etc.) which are here. Therefore OSI is not that important.

The telephone system is not OSI.

I do appreciate that the telephone system has evolved and Gerard's precis of its evolution is good one. But today telephone systems and their standards are converging and moving to digital technology. What is lacking is the fact that the Internet technologies have learned very little from something that has a global numbering scheme. The numbering scheme may not be perfect, but it is quite stable and global and is administered within each country for that country. So if a country makes a mess of it, it is the respective country's responsibility to sort it out. This is *not* the case with the Internet technologies and its addressing scheme.

I am glad my OSI reference to the telephone system amused Gerard. If OSI is a framework for standards then there are physical layer standards, link layer standards, network layer standards, etc. Perhaps I assumed that the physical layers of the telephone system were in fact defined by international standards (although there may be a few options here). Perhaps I assumed that the signalling standards for ISDN, SS7 and Digital Subscriber Signalling (because some of these do relate to link and network layer protocol exchange) are conforming to OSI. Or perhaps I just read the words 'physical layer,' 'link layer,' and 'network layer' in these international recommendations and assumed their compliance.

SDH and ATM are virtually the first instances of the adoption of standards for the internals of carrier networks.

I wonder what G.703/4 (PDH) Transit signalling (X.75, etc.), X.96 Call progress signals, X.25. V series, F series, I series, X series, Q series, G series, etc., etc., actually do?

The direction charted by the US Government will be relevant to other countries.

Maybe it will be — even though large organisations in the US condemned the FIRP report as did the CCTA (UK Government) and others. In fact, the European Union is still holding GOSIP and EPHOS (European Procurement Handbook for Open Systems) very high on the agenda. My own views are well known. I wonder what Japan and Korea are doing about this? Waiting for the US to decide?

The way ahead for global internetworking seems unclear.

Perhaps my articles have not been explicit enough? I wonder why all those multinationals, carriers, academic institutions, consultants, etc., spent so much time formulating *global* networking standards and addressing schemes with the ITU and ISO? I certainly see the way ahead for internetworking! It's called CLNP, ES-IS and IS-IS and NSAPs. And the way to global messaging systems is X.400, X.500 with X.700 management.

I will add some other OSI points that seem to have escaped people. If GOSIP is dead and the US and Internet are still the owners of the world's addressing scheme. How does a country reconcile the fact that its security, defence and government agencies have to go to the nearest university to pick up a range of TCP/IP network numbers issued by the US. Surely this a total breach in national security. All the universities, etc. in the world know how many people there are in a nation's defence and government agencies. To me this is totally unacceptable. To repeat the text from my article the March edition of *Australian Communications*: 'The reason for GOSIP is that it defines internationally administered addressing schemes and globally standardised naming, networking, routing, messaging and management functions which are all supported by the world's carriers. These elements are essential for large scale government networks.'

The next point also gets overlooked. If Australia is looking for an IT industry why do we all say we will forsake a strong push to OSI and international standards just because the US wants to take a 'more balanced' view? Instead of bowing down to the 'killing of GOSIP' from the people who have little vision or no desire for international standards, why do we not take advantage of the fact and push OSI into our IT export programs? If you do not think there is a market out there, just ask how many TCP/IP addresses have been put aside for China and South East Asia? Just a thought.

I will close this debate simply by saying 'my distortions' have been addressed by adding yet more negative comments and confusion to what OSI is and its position in the world. The response is certainly not a 'balanced view.' It seems to say that OSI is just a few applications which are not here yet and because of history something other than OSI communications and distributed system technologies has to be found. Also, with respect to the 'new networking protocols' I really cannot see another internetworking protocol being developed by the standards bodies simply because of the cost and the fact that CLNP and its global addressing scheme works.

I will thank Gerard for at least giving OSI a little credit. A year ago OSI was 'dead' and 'slow' and TCP/IP was on the verge of replacing it before it got started. The IETF has liaison status with the ISO and it will now have to adopt the ITU/ISO procedures. So the bit about 'the standards process being too slow' is now a dead argument. And finally there are now ITU/ISO NSAPs being applied to workstations, so OSI is now on the desktop. It is quite certain that I will never see a TCP/IP or an SNA address allocated to my telephone.

I think the OSI debate is over. Today OSI has credibility, relevance and is working across the world. Perhaps next year it will get the credit it deserves. One thing is for sure, OSI will not go away.

Alan Lloyd

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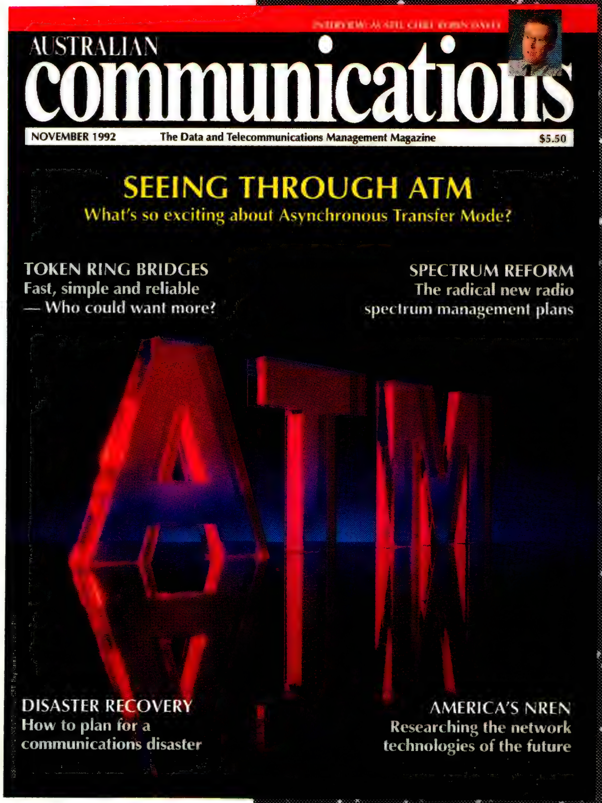

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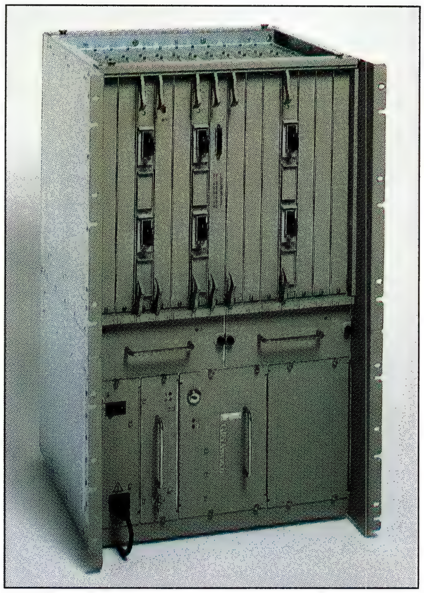
GIGAswitch: Bandwidth to Burn

Digital's high-speed fast packet switch is as robust as they come — it simply can't be overloaded, and will never drop a valid packet.

There are many techniques of increasing the effective bandwidth of an Ethernet or Token Ring transmission system; various forms of bandwidth switching or the use of collapsed backbone topographies are becoming common. However, there are an increasing number of applications and application platforms which require more bandwidth than techniques such as this are capable of providing.

In such situations the only alternative open to a network administrator is to implement a system which supplies brute bandwidth, or to argue that the operational parameters of the application or platform in question be changed to something which can be supported by deployable technology — the latter option, when plausible, generally being regarded with extreme distaste.

Making the transition to FDDI technology may not be enough to solve the problem. FDDI provides a synchronous access 100Mbps path which, using UTP technology, can be cost effectively deployed as a LAN backbone for server/host farms and so on, but when those hosts or servers are capable of using 15 to 20Mbps each, a single FDDI ring can be overloaded very quickly. Most minicomputers, mainframes and high-end Unix workstations can easily generate this sort of traffic load. Even PC-based servers running distributed database applications can significantly load a single FDDI ring — 100Mbps just is not that much anymore.



When administrators are faced with such situations the only standards-based option they can apply has been, until relatively recently, a combination of FDDI to provide 100Mbps 'fat' pipes to small groups or individual machines, and high performance bridges or routers between FDDI rings. High end routers are extremely expensive pieces of hardware, require relatively complex configurations, and often still have a latency higher than their owners might wish. Such devices are designed to operate as gateways between LAN and WAN speeds rather than as a very high-speed LAN packet switch.

ATM Support

Digital's GIGAswitch FDDI packet switch has been designed from the ground up to provide a highly reliable, cost effective option for those who need brute bandwidth either as a single site backbone or hub to interconnect servers, hosts and/or network storage devices.

The GIGAswitch is a 14-slot unit which fits a standard 19-inch rack, supports n+1 redundant power supplies (AC Line of 48 V DC), redundant System Control Processors (SCP) and up to 11 line cards. Line cards support all forms of FDDI or a number of ATM interfaces, and are hot swappable. The DEFGL-AA and -BA FDDI line cards do not contain PMDs (Physical Media Devices), but support all types of FDDI media and interfaces via modular PMD daughter cards.

GIGAswitches may be interconnected via either FDDI links or ATM connections via an ATM line card, which like its FDDI equivalent, supports modular PMDs — DEFGE-AA (DS-3, 45Mbps), DEFGS-AA and DEFGS-BA (OC-3, 155Mbps MMF and SMF). GIGAswitch can also support Digital's full duplex FDDI implementation and standard features such as dual homing, SAS, DAS (with external optical bypass switch) in any combination and out-of-band management. The units are manageable via SNMP with SMT version 7.2 from HUBWatch version 3.0 running under VMS, with Windows and OSF/1 versions due to ship in September. Version 2.0 of the GIGAswitch's firmware allows the support of up to 16,000 network addresses across all ports and also provides an ARP server on the unit's SCP.

Digital's HUBWatch provides a clean, simple management interface which, when combined with the GIGAswitch's physical simplicity, effectively hides the unit's quite devastating performance; not even the raw numbers given in the sales blurb — filtering rate of 446,000 frames per port per second, forwarding rate of 290,000fps, aggregate throughput of 3.6Gbps and a switch connection rate of 6.25 million connections per second — do not truly do the unit justice.

The simple fact is that no physically possible traffic load can overload the GIGAswitch; it will never drop a valid packet which must be forwarded. There are very few devices on the market which can make that claim. Some small indication of the engineering required to achieve this level of performance can be gleaned by examination of the process by which the unit forwards a frame. The frame is buffered and three fields are examined. Most of those fields are 48-bit quantities which must be looked up in a table of up to 16,000 entries. In worst case load conditions that requires that each line card has the capacity to perform 1.3 million lookups per port per second.

The GIGAswitch, combined with Digital's DEChub 90 and 900 series, its DECconnect structured cable system and its future ATM product releases — for instance, the Premises ATM Switch — make the company a force to be reckoned with in the general transmission systems market, particularly when Digital's service and support organisation is taken into account.

Products like the GIGAswitch are designed to support 'bet-your-business' applications; and without the sort of service and backup available from an organisation with Digital's reputation they would be next to useless. Hopefully, this fact will counter Digital's traditionally poor marketing of its best products.

Graeme Le Roux

PRODUCT SUMMARY

Name: GIGAswitch

Description: High performance FDDI packet switch with ATM capability.

Price: DEFGA-CA GIGAswitch (chassis only): $4,380; GIGAswitch power supply: $4,380; 48 V DC Power front end: $4,380; Daughter cards from $4,380 to$7300; Line Cards from $13,140 to $22,630; DEFGP-AA System Control Processor (at least one required): $21,900; PMD Daughter cards from $364 to $4,622.

Vendor: Digital Equipment Corporation,
410 Concord Road, Rhodes NSW 2138
Tel: 008 021 393

Enterprise-Wide Backup System

Symantec's new Norton Enterprise Backup saves data from multiple LANs to more than one tape drive.

When it comes to corporate networks, there's one maxim net managers know only too well — the bigger they are, the harder they fall. So it's hardly surprising that as internetworks continue to grow in size, backing up the data they carry is becoming Job Number One for LAN administrators.

That's easier said than done. Traditional backup solutions are built to work with only a single tape server on a solitary LAN. Symantec has a cure for the backup blues. Its Norton Enterprise Backup (NEB) is one of the first software products able to save data to more than one tape server distributed across multiple LANs. NEB has at least three features to recommend it. First, it allows several backup devices to be managed and configured from a central net management console. Second, the software automatically recognises new workstations as they are added to the network and integrates them into the backup scheme. Third, the package dynamically reroutes data to other backup devices in the event of a tape failure.

Run the Tape

NEB runs on NetWare 3.X and 4.X LANs and conforms to Novell's SMS (Storage Management Services) specification. SMS defines design criteria for backup applications running under NetWare. Any third-party backup package that conforms to SMS in theory will work smoothly with any version of NetWare.

In its first release, NEB works only with tape storage devices, but Symantec says support for optical storage will be added. The product is supplied as two separate sets of software. The first consists of three NetWare Loadable Modules which are installed on every tape server attached to the network (tape servers are non-dedicated NetWare servers with connected tape drives). NEB Control.NLM assigns backup sessions to tape drives; NEB Tape.NLM interleaves data from multiple sources for backup on a single tape drive; and NEB Object Based Manager.NLM (OBM.NLM) keeps a log of the location of all workstations and tape servers on the network.

The second part of the package consists of memory-resident software agents — called Target Service Agents (TSAs) — to be installed in every workstation and server that managers need to back up. TSAs are available for DOS, Windows, and OS/2; Macintosh and Unix TSAs are under development by Novell.

The TSAs can be installed in each PC from a disk; alternatively, net managers can prompt users to initiate a remote download over the network when they boot up.

Sit Back and Back Up

NEB bundles network management software that gives administrators an overview of all data sources (servers and workstations) and tape servers from one console. In the past, managers running multiple tape backup products had to toggle between multiple screens to keep track of network backup.

PRODUCT SUMMARY

Name: Norton Enterprise Backup (NEB)

Description: Software for backing-up data on multiple NetWare LANs to multiple tape drives.

Price: The Norton Enterprise Backup complete system is priced at $3,275. Optional additional tape/media software sells for $1,635 per tape/media server. Client software is sold in packs of 5, 10, 50, 100, 250, 500 and 1,000 and costs from $545 for 5 licences.

Vendor: Symantec P/L, 408 Victoria Rd, Gladesville NSW 2111 Tel: (02) 879 6577.

The management software is equipped with a text-based DOS interface that enables administrators to assign each server and workstation to a tape storage device (a Windows version is due for release in August). NEB also has a default setting that will automatically allocate backup resources to different nodes without user intervention.

NEB makes net managers' lives easier by automatically recognising new workstations as they are added to the network and incorporating them into the backup scheme. Software running on the tape servers automatically polls the network for new workstation TSAs at predetermined intervals. When a new device is discovered, the server database is updated, as is the resource list on the management console (see the figure). The same polling scheme is used to detect device failures and allow data to be rerouted to alternate backup resources.

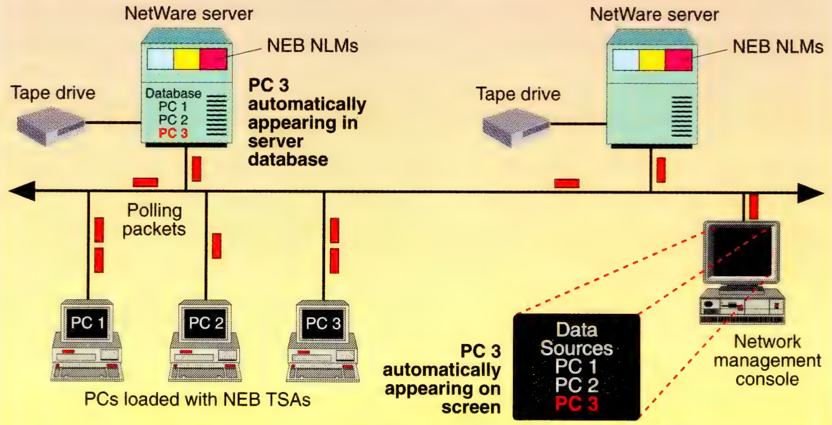
The software package further reduces net managers' workloads by enabling users to access data stored to tape on their own. With some products, users must call the administrator, who undertakes the restoration from the net management console.

NEB is the latest addition to Symantec's suite of LAN administration tools — called Norton Administrator for Networks. Other packages are available for tracking hardware and software and monitoring and metering software licences. Later this year, Symantec plans to integrate these applications with HP Openview for Windows 7.2. That's significant because it bridges the gap between LAN administration and net management, allowing managers to run both kinds of application from a single console.

Stephen Saunders

A Single Backup Solution For Multiple LANs

Symantec's Norton Enterprise Backup runs both on tape servers and on workstations across multiple LANs. The server component continuously polls the network for new workstations and integrates them into the backup scheme.



NEB = Norton Enterprise Backup NLM = NetWare Loadable Module TSA = Target Service Agent

HP Takes Lead in 100Mbps Derby

The industry's first 100VG-AnyLAN products are scheduled to start shipping soon.

Back in 1992, when Hewlett-Packard announced it intended to co-develop a 100Mbps LAN standard to be called 100Base-VG, networking handicappers rated the plan an instant also-ran. The early line was that formidable competition from the likes of FDDI, ATM, and other fast Ethernet schemes would keep HP's entry out of the money — that is, if the HP proposal even made it to post time.

But as any punter knows only too well, races don't always go according to form. HP's LAN proposal, now dubbed 100VG-AnyLAN, is nearing formal approval as the IEEE 802.12 standard. And this August HP is scheduled to begin shipping a line of 100VG-AnyLAN hubs and adaptors, beating most competing 802.3 fast Ethernet products out of the gate.

It's true that SynOptics was the first vendor to market with a fast Ethernet offering. The company announced the release in June of its LattisSwitch System 28000 hub, which is based on the competing 100Base-T fast Ethernet specification and on SynOptics's own Fast Frame technology. The product was developed as part of a joint partnership with Intel, and both companies are part of a group of vendors, which also includes Ungermann-Bass and 3Com, who support the 100Base-T standard and the retention of CSMA/CD as part of the new IEEE fast Ethernet standard.

But 100Base-T may have run up against an insurmountable hurdle recently, with reports that it is restricted in the maximum LAN diameter it can support. While both 100Base-T and 100VG-AnyLAN will permit 100Mbps connections over low-grade (Category 3) unshielded twisted-pair (UTP) wiring, 100VG-AnyLAN specifies much greater end-to-end distances than the rival fast Ethernet proposal accommodates.

Of course this doesn't guarantee HP a trip to the winner's circle, but other factors are putting the vendor, and 100VG-AnyLAN, in position for a strong stretch run. Versatility is a 100VG-AnyLAN strength: it goes 100Base-T one better by accommodating Token Ring as well as Ethernet traffic. (The initial version of the HP product line is only able to handle Ethernet packets; HP says Token Ring support will come early next year.)

And now that HP has announced product prices, it's become apparent that 100VG-AnyLAN holds one clear advantage over FDDI and ATM offerings: low cost. The hardware cost for a 15-node 100Mbps LAN based on HP's hub and adaptor products is as low as about $995 per node. That's about three times the cost of conventional 10Mbps Ethernet LANs, but about one-fourth the price of current 100Mbps FDDI offerings and much less than the price of 155Mbps ATM products.

With products due to ship very soon, HP is jumping the gun on formal approval of the IEEE 802.12 standard, which isn't expected until later in the year. But HP asserts that its first range of offerings are based on the most recent 802.12 draft standard, and that this draft standard is unlikely to change before formal approval.

PRODUCT SUMMARY

Name: Advancestack 100VG Hub 15, 10/100VG Selectable ISA and EISA Adaptors, and 100VG Bridge/SNMP module.

Description: First hub and network adaptors to implement the proposed 100VG-AnyLAN (IEEE 802.12) standard for 100Mbps Ethernet and Token Ring LANs.

Price: Advancestack 100VG Hub 15 $5,810; 10/100VG Selectable ISA and EISA Adaptors $599 and $900 respectively; 100VG Bridge/SNMP Module $2,270. All are due to ship in August.

Vendor: Hewlett-Packard, 31-41 Joseph St, Blackburn VIC 3130 Tel: 13 13 47

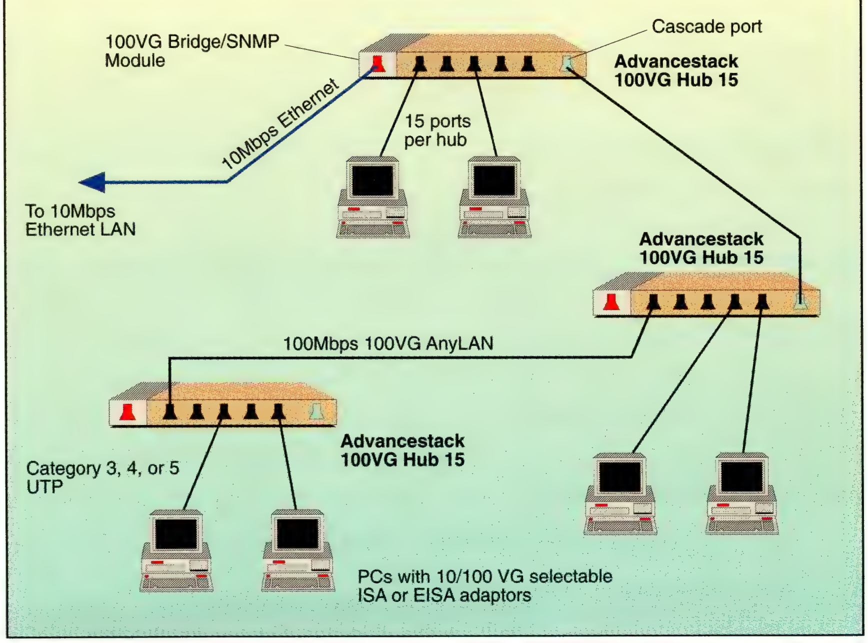
The Opening Line-Up

Four products comprise HP's new high-speed LAN line: a hub, two kinds of workstation adaptor, and a bridge module. The new Advancestack 100VG Hub15 ($5,810) comes with 15 RJ-45 workstation ports and one port for connecting to another Advancestack hub (see the figure).

HP's 10/100VG Selectable Adaptors, which come in ISA ($599) and EISA ($900) versions, work with either 100Mbps or conventional 10Mbps Ethernets. The 100VG Bridge/SNMP Module ($2,270), which slots into the Advancestack hub, provides both a connection to conventional 10Mbps Ethernet LANs and an SNMP management agent. (The Advancestack hub also comes with an EIA-232 port for out-of-band management using Stackmanager, Hewlett-Packard's Windows-based network management package.)

Making Way For AnyLAN

HP's 100VG-AnyLAN hub and adaptor products provide 100Mbps transmission speeds for Ethernet (and later Token Ring) traffic. Advancestack hubs can connect to conventional 10Mbps Ethernets via a 100VG Bridge/SNMP Module.



The Technology

The HP products make use of two key elements in the proposed 100VG-AnyLAN standard: a new line encoding scheme known as quartet signalling, and a network access control technique known as demand priority. The former technique allows 100-VG-AnyLAN to work over standard copper cable and boosts its operating distance; the latter enables compliant LANs to carry delay-sensitive traffic like real-time voice and video.

With quartet signalling line encoding, signals are spread over four wire pairs to keep electromagnetic radiation within the limits set by the US Federal Communications Commission. Quartet signalling works over Category 3, 4, and 5 UTP cabling, and since most UTP cabling now in place comprises four wire pairs, chances are good that 100VG-AnyLAN networks can run over existing building wiring.

With Category 3 UTP, cable runs from workstation to hub can be as long as 100 metres. With Category 5 cable, that run can extend to 200 metres. (HP has not yet specified how far data will travel over Category 4 UTP).

Organisations can extend the reach and size of their LANs by cascading Advancestack hubs. Two hubs can be daisy-chained together using the cascade port. For larger networks, hubs can be installed in a tree topology in which one hub acts as a ‘root’ device and the others are connected to it using its 15 ports.

The 100VG-AnyLAN spec allows for a maximum end-to-end LAN distance of 1,200 metres for Category 5 UTP and 600 metres for Category 3 wiring. Those operating ranges are significantly greater than those specified in the 802.3 fast Ethernet proposal; under 802.3 fast Ethernet, the maximum end-to-end distance for Category 5 UTP is 220 metres.

The restriction is apparently caused by the fact that the 100Base-T fast Ethernet utilises a souped-up version of CSMA/CD, which is not used in the 100VG-AnyLAN system. In both technologies, ranges can be extended by adding internetworking devices like bridges and routers — a potentially expensive proposition.

Demand priority is a two-level priority station scheme that can be used to give delay-sensitive traffic first crack at network bandwidth. Demand priority also helps cut network overhead to provide utilisation rates as high as 95% with 1,500-byte packets and 98% with 4,500-byte packets. It achieves this by centrally allocating network access from the hub, rather than forcing attached workstations to negotiate between themselves to decide which one of them should have access to the network at any given time.

Double-Duty Module

HP’s 100VG Bridge/SNMP Module performs two tasks. On the net management side, it enables a console equipped with any SNMP-compliant net management package to monitor and control up to 16 cascaded Advancestack hubs. The bridge part connects Advancestack hubs to conventional 10Mbps Ethernet LANs.

The two HP adaptor cards can operate at either 10Mbps or 100Mbps, which means net managers can use them now on existing Ethernets and then switch them to 100Mbps at a later point. Drivers are available for Novell NetWare and Microsoft Windows NT and Windows for Workgroups.

As is the case with the 100VG-AnyLAN spec, HP’s products will be limited to one network type (Ethernet or Token Ring, but not both). The vendor says its dual-function products will cost the same as its Ethernet-only line, but it hasn’t decided whether its initial products will be upgradeable to handle Token Ring.

Stephen Saunders

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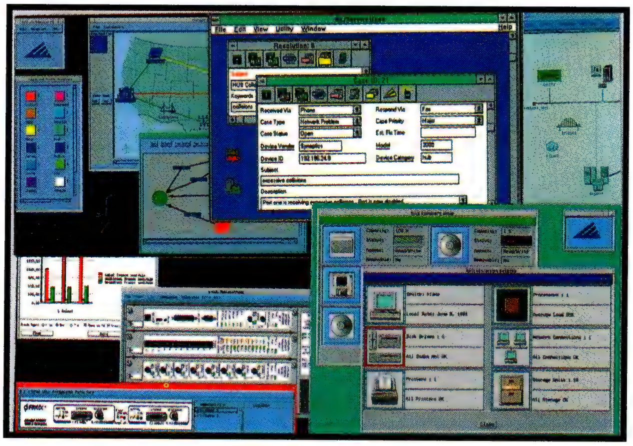

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SITA — A Global Player Spreading its Wings

Jean-Paul Schittenhelm

Regional Vice President, SITA

Jean-Paul Schittenhelm is Regional Vice President, Australasia and South Pacific, of the Société Internationale de Télécommunications Aéronautiques (SITA). Established in 1949 as an international airline cooperative, SITA now owns and operates the world's largest private data network and has extended its services to all industry sectors through subsidiaries such as Scitor and ITS. Before joining SITA in 1990, Schittenhelm had a long career in the airline industry, including positions as Regional Director for Air France. He has been honoured by the French Government for services to international trade. Liz Fell spoke with him at SITA headquarters in Sydney.

When SITA says it owns and operates the world's largest private international data network, what does that involve?
Schittenhelm: SITA certainly is the most global network in the sense that today we are present in more than 220 countries and about 1,500 cities. No other telecommunications carrier or value added network organisation has such a major presence in so many countries or buys circuits from carriers in so many places.

AC: *Where is SITA actually based?*
Schittenhelm: SITA is a Belgian organisation, but the boss is in Geneva, marketing is in London, finance is in Paris and research is in Montreal. We're everywhere really. You have to be sitting somewhere otherwise you'd be in the air!

AC: *In cyberspace perhaps!*
Schittenhelm: Yes. We don't belong to any country.

AC: *As a provider of managed data network services, do you see SITA as competing with the telecoms carriers?*
Schittenhelm: We are a value added network provider and the carriers do that as well. So we can be in competition with them and obviously we are always in partnership with them because we buy their circuits.

AC: *SITA has expanded beyond servicing airlines to include other market segments. Can you outline this expansion?*
Schittenhelm: We have expanded our products as well as our customer segments. Basically, SITA has five major products: messaging, including EDI; transactional services, such as reservations; air-to-ground services, whether through VHF or satellite; software services, which we provide out of data processing centres in Atlanta and London; and airport information through a system called CUTE [Common Use Terminal Equipment].

AC: *Does SITA offer frame relay access?*
Schittenhelm: Yes. We recently launched a global frame relay product in most markets, including Australia.

AC: *With the air-to-ground satellite services, is it correct you have partnered with several carriers including Telstra?*
Schittenhelm: Yes. Air-to-ground telecommunications services are becoming increasingly important. With satellite, all the new interactive services are possible. They will be superhighways on planes!

AC: *Are you applying the superhighway concept to airlines?*
Schittenhelm: That's right! These Satellite Aircom services are important for pilots and security. But passengers in the cabin will have all the services they can dream about.

AC: *What range of services do you offer through the data processing centres?*
Schittenhelm: We have about 100 different services for the airlines. The Atlanta centre, based on Unisys, provides the computerised passenger reservation system known as Gabriel as well as baggage tracing and so on. The London centre, based on IBM, offers services such as Flight Planning and Crew Management. I suppose the five or six biggest airlines could support their own networks, but they use SITA because its more convenient and probably cheaper. All the other airlines need a shared system otherwise they probably couldn't compete. That's the philosophy behind the shared system.

AC: *How does the CUTE system operate?*
Schittenhelm: We have CUTE in Sydney. Airlines used to have hundreds of people lining up at probably three or four check-in counters and they couldn't use the empty counters next door. Now they can use SITA equipment at any check-in desk or boarding gate and sign into their mainframe. CUTE provides better usage of airport facilities and a better service for the customer.

AC: *I understand SITA signed one of the first outsourcing arrangements in the world back in 1950?*
Schittenhelm: Yes. We took over the telecommunications centre of Air France in Paris. Now outsourcing is a magic word but, in fact, SITA has done it for years without knowing it.

AC: *Is outsourcing a growing area for SITA?*
Schittenhelm: Yes. It's certainly an expanding market. The airlines, for instance, are trying to get back to their core business after having developed in-house solutions with a lot of staff and so on.

AC: *Airlines like Qantas?*
Schittenhelm: Qantas does a lot in-house and have handed over bits and pieces. But the economies of scale we get will become increasingly important in the future. In the last four years, we have had an increase of around 700% in bandwidth here. When you have such an increase in bandwidth, you have economies of scale.

AC: *Presumably SITA's massive increase in bandwidth here is linked to the strategy to expand to other industry sectors?*
Schittenhelm: Yes. We catered only for airlines until 1987. But because of deregulation

and because of open architecture with the airlines taking X.25, we faced new competition. In the telecommunications business today if your annual growth in traffic is not about 22-25% then you are not at the world level. And if you are not at the world level, you go backwards. The airlines were able to help us increase our traffic on a yearly basis by about 15%, so we decided to enter other market segments that we understand, the transport and travel related world. That included airline manufacturers, airports, travel agencies and tour operators such as Jetset and Club Med. These groups were close enough so that our charter as a cooperative would allow us to go in. We now have more than 500 members.

AC: *Is every regional office of SITA under pressure to deliver annual traffic growth of 25%?*
Schittenhelm: Yes. SITA now achieves this worldwide, and this region actually delivers much more. You need to deliver 25% to have a cost reduction of 9-10% just to stay in business. Now everybody is aiming at 30% traffic growth.

AC: *And you are now targeting other sectors to reach 30%?*
Schittenhelm: Yes. We decided to go into the open market. But as a cooperative organisation, we couldn't do that so we created a subsidiary, Scitor, to cater for the non-airline, non-travel and non-transport-related world. We are going for international business whether this is airlines, hotels or banks. You name it. In the domestic sector, we are going after travel-related business that we know very well. For example, we have a contract from TIAS [Travel Industries Automated Systems] to connect some 4,000 travel agents in Australia and New Zealand.

AC: *Will SITA's purchase of a major interest in the transactional software services company, Novus Technologies, have any flow-ons for Australia?*
Schittenhelm: Novus is a worldwide company with a head office in Holland and major offices in London, Boston and Atlanta. They have an important branch here which is obviously very helpful for us. Novus have been extremely strong in software in the airline and in transport-related business.

AC: *Was that acquired by SITA or Scitor?*
Schittenhelm: By SITA.

AC: *Which customer groups are you looking at in Australia?*
Schittenhelm: We'd be pleased to work for any corporations which are international or even global. Government bodies are important for us because we feel reasonably close to them. Being owned by airlines, many of which are owned by governments, in some sense we are also owned by governments.

Banks are also attractive because they are more international than in the past with quite high traffic needs. If you go into third party business, you have to knock on the door of banks. They are an important area in the IT business. I was surprised to see some New Zealand figures recently showing that government bodies represent nearly 70% of the IT business whereas banking is about 10%.

AC: *Have you signed up any of the banks?*
Schittenhelm: In Australia, we haven't tried the banks yet. It is a question of timing and having the organisation to cope with expansion. We are coping already with an increase of bandwidth of about 700% and an increase in the number of connections of around 700% as well.

AC: *In the financial sector, won't you be competing with the Financial Network Association, in which Telstra is a shareholder?*
Schittenhelm: Yes. But I'll give you an example of cooperation with Telstra . . .

AC: *But I was asking about competition!*
Schittenhelm: We call it 'coopetition'! As an example of cooperation, we wanted to tender for the Department of Foreign Affairs and Trade network which would connect embassies and consulates in more than 100 countries. Telstra wanted to compete too so we decided to go together. We are not well-known in the non-airline market so it helped to have Telstra as a partner.

AC: *Telstra also tendered for that contract with Infonet. What advantages did SITA deliver?*
Schittenhelm: The tender was for clear bandwidth, a business we are not really in. It was also for voice, another business we are not in really though we have some corporate voice. But the tender was also for data transfer and as far as SITA's X.25 network is concerned, we have people in 200-plus countries. That's the reason we won. Everybody can have circuits. But our presence in these countries means we know how to talk to telecoms people and to governments so when regulation is a bit tight, we probably have more chances to convince them. If Foreign Affairs and Trade had chosen another service provider, they would probably have to work with 10 or 20 or 30 different companies. With SITA, they work with only one. If they have a problem in Moscow or Cairo, they come to us and we have SITA staff there with the same culture. That makes a major difference. You should ask Infonet how many countries they are in.

AC: *SITA's presence in so many countries must be a real advantage over other global network service providers like BT and AT&T.*
Schittenhelm: That is our strong selling point. But we are a small organisation compared to BT or AT&T despite the fact that the Yankee Group has placed us as the number one VAN in the world.

AC: *How does that ranking apply to SITA in Australia?*
Schittenhelm: I've no idea. When we tender for something, BT is there. But they don't get the business. They haven't got the network or presence in all those countries.

AC: *Your area of responsibility covers the South Pacific. What is SITA's interest in Fiji which you visited recently?*
Schittenhelm: We cover all the major islands to serve our clients here. In Fiji, where we have centres in Nadi and Suva, our business is related mainly to airlines and governments. Australia's Department of Foreign Affairs and Trade, for example, needs a connection to Fiji so we have to give them that.

AC: *But aren't there regulatory limitations?*
Schittenhelm: Limitations are interesting. They go from completely open to completely closed and they change every day. The telecommunications people in Fiji were surprised, and probably a little bit shocked, when we asked for a connection for Foreign Affairs and Trade. But I spent a long time explaining what SITA was doing and where it is going.

AC: *Presumably that would be seen as third party traffic?*
Schittenhelm: What is third party traffic? It's whatever you call it! Our charter says that we normally serve the travel/transport world and that includes serving governments through their state-owned airlines, so I have no problem with this one. If American Express asks for a connection somewhere in the island nations, I have to connect them. The local law may allow this or I may have to negotiate.

AC: *Is SITA now offering corporate voice services?*
Schittenhelm: Until recently, the airlines had very little need for corporate voice. The big airlines had their own corporate voice and the small airlines had limited needs. Now they starting to feel these needs so we are starting to offer corporate voice. The best way to do that is to form strategic alliances.

AC: *Is that why SITA has formed an alliance with the European carriers that are members of the Unisource consortium?*
Schittenhelm: Yes. Our alliance with Unisource allows us to offer all the products that clients need and gives us market penetration, especially in Europe. We have a network and products; Unisource has a network and products. Together we have defined the tariffs and who will tackle each market.

AC: *Does the Unisource alliance deliver customers in Australia?*

Schittenhelm: If I have a an Australian client who needs voice in Europe, for example, I can offer Unisource voice.

AC: *Would it be correct to say SITA is weak in the North American market and needs a strategic alliance there?*

Schittenhelm: My feeling is that SITA will have a strong position in Europe thanks to Unisource, but it will need to venture with someone in a strong position in North America and it will look for a strategic partner or partners in the Asia-Pacific.

AC: *Is SITA talking with carriers in the Asia-Pacific about potential alliances?*

Schittenhelm: SITA in the last few years has had talks with many carriers, including KDD in Japan, Cable & Wireless in Hong Kong, Singapore Telecom and Telstra, to see how we can work together in some way.

AC: *There are press reports that SITA is considering an equity sale later this year under a reorganisation plan. Are these correct?*

Schittenhelm: As a Société Cooperative, SITA's funds come mainly from members, with a little from the banks. Our members are always prepared to give us money when we invest in our network for the airlines, but they're not so prepared to give us money for the investment we need for non-airline customers. So for SITA to have access to the normal money market, it will have to change its structure. The board members have been working on that for about 18 months.

AC: *Does that mean there will be a commercial company backed by equity with outside investors as well as a non-profit cooperative servicing the members?*

Schittenhelm: I can't speak with authority on that. You should talk with Ken McConville, the head of Qantek, who is one of the 27 board members of SITA.

AC: *When do you expect the new structure will be resolved?*

Schittenhelm: A proposal will be put to the membership at the General Assembly in Brussels at the end of June. But it's not going to be a revolution. It will be an evolution.

AC: *In the Asia-Pacific, SITA has hubs in Singapore, Tokyo, Hong Kong and Sydney. Presumably the Australian hub is not as big as Singapore or Hong Kong?*

Schittenhelm: Australia does not have as many airlines or as many customers. Asia obviously has more or potentially more. But Australia has become an extremely big hub because telecommunications deregulation has led to enormous expansion.

AC: *How does the hubbing work? Do you shift bandwidth from one hub to another?*

Schittenhelm: It's completely meshed. To operate the network 24 hours a day, we have divided the world into three. For practical reasons, we chose Singapore, Atlanta and Paris but it could have been three other places.

AC: *Has Australia's limited access to diverse international optical fibre cable routes been a disadvantage?*

Schittenhelm: Well, PacRimWest will be operating at the end of the year. Until then, we have to use satellite in some cases and it's true that satellite doesn't deliver the same response time as cable. Because 60-70% of our business is transactional, response time is critical. We have a transit time of less than one second for traffic and that's something we want to reduce. It's only cable that can really offer that to us.

> *"Everybody can have circuits. But our presence in these countries means we know how to talk to telecoms people and to governments so when regulation is a bit tight, we probably have more chances to convince them. If Foreign Affairs and Trade had chosen another service provider, they would probably have to work with 10 or 20 or 30 different companies. With SITA, they work with only one."*

AC: *Lots of reasons are advanced for establishing regional headquarters in Australia. How important was the overall social and political environment?*

Schittenhelm: There's no doubt when you create headquarters and try to attract international talent, it's much better if the environment is good. Australia and Sydney are fantastic. You find very skilled local staff in the IT business, which you don't find always in other countries, and costs are reasonably static while Asia goes up. In telecommunications, when you start up something for a long time, the environment must be very positive. Australia is very stable politically. I'm not speaking about the politicians!

AC: *What negotiations were involved with the Federal Government for SITA to build an Australian hub?*

Schittenhelm: We are owned by the airlines, so as far as the Federal Government was concerned, we wanted the status of an international organisation. In countries like Canada and Switzerland and many others, we enjoy privileges because we are recognised as an international organisation. It's very important that we expand under these conditions.

AC: *And do those privileges include tax free status?*

Schittenhelm: Yes. SITA is a non-profit organisation so therefore we don't pay any taxes. We try to sell for the price that it costs. If by accident we have a surplus, it goes back to the members.

AC: *But didn't SITA need a surplus to set up Scitor?*

Schittenhelm: No. The network was there. Scitor is a commercial organisation that pays tax everywhere. We have another company, ITS, which sells solutions, hardware and specialist maintenance. It makes profits and pays tax too.

AC: *The Federal Government recently announced a new tax concession package to attract companies here. Does SITA's tax free status give it advantages over competitors?*

Schittenhelm: I don't know. I hope so. Another company may not make profits either so it could be just as cost-effective.

AC: *Did the State Government offer enticements for you to hub in Sydney?*

Schittenhelm: There was an agreement where we got funds from the NSW Government and we put in money to do research and development in areas like distance training, EDI and face recognition for security at airports. The University of Wollongong has access to the product for export.

AC: *Who has the intellectual property?*

Schittenhelm: It's shared. As far as training is concerned, it's shared between the University of Wollongong and SITA. The research which we pay for fully obviously belongs to us.

AC: *Has competition from Optus affected your business?*

Schittenhelm: As you know, Optus have concentrated on mobile and long distance voice. As far as data is concerned, there haven't been major changes in pricing.

AC: *I understand that the Australian carriers, even with discounting, are less price competitive for international circuits than the monopolies in Singapore or Hong Kong. Why do you think this is the case?*

Schittenhelm: I don't have the answer to that. Are the costs higher here because of the size of the country? Is it because Hong Kong and Singapore are trying to attract more companies there?

AC: *Are the higher Australian prices a concern for SITA?*

Schittenhelm: We often go to Telstra and say: 'That's the price we get out of Hong Kong, and that's the price we get out of Australia. If you want Australia to be a major international hub, you should take that into account.' This must have had some effect because our prices have been dropping every year. Whether this is because we have a long-term agreement based on quantity or because of pressures of competition or technology, I don't know. But it's true that Australia is not as inexpensive as certain other competitive nations.

AC: *Will SITA's long-term agreement with Telstra be affected by the new framework applying to tariff discounts?*
Schittenhelm: I haven't followed that in any detail so I can't really comment.

AC: *Is SITA regarded by Telstra as a service provider or as a customer?*
Schittenhelm: I think we are both. We are a customer and we're going to stay a customer. But we're becoming more and more a service provider as well because each time the carrier doesn't add value then we obviously become a value added organisation.

AC: *If prices vary for customers and service providers, isn't that distinction crucial?*
Schittenhelm: That's right. We would like to have access to either price, and the one that is cheapest obviously. We are having discussions with them on pricing and also on service quality, which is at least as important to us.

AC: *Don't you have service quality guarantees with Telstra?*
Schittenhelm: Yes. But what our customers are used to getting from us is higher than the guarantees we get from carriers.

AC: *But aren't there financial penalties if carriers don't deliver on these guarantees?*
Schittenhelm: Yes. But it doesn't work like that because we're not looking for money. If something happens, we want them to rectify it very quickly. It's more like a partnership. Our problem is not going to be solved by telling a carrier that they owe us $20,000 or $50,000. We want quality.

AC: *So what happens if carriers don't deliver that quality?*
Schittenhelm: We can change carriers, obviously, or we can ask that they use other carriers in areas such as North America. For the moment, we have very good service from Telstra so we have the quality which we require. That's the reason we manage to give 99.98% availability to our own customers and our transit time is extremely low.

AC: *Does SITA itself have quality guarantees in customer contracts?*
Schittenhelm: Yes. Our contracts are based on quality as well. But again our clients who are real partners say they are not interested in money. They're interested in quality and solving the problem quickly. For instance, I remember when DHL, who work with us worldwide, was asked at an AGM about the kinds of guarantees they had from SITA. The chief executive said that when DHL signed the contract, they didn't talk about how much money would be paid because they were only interested in service. They wanted to know how the engineering and operation departments were going to react to problems and how they could be partners with SITA rather than customers.

AC: *Clearly worldwide deregulation has benefited SITA?*
Schittenhelm: Deregulation has meant major opportunities because of our fantastic network and staff. But it has also meant major threats because we're not protected any more, so there's a balance. We haven't lost any customers so far.

AC: *Do you think SITA may become a carrier in the future?*
Schittenhelm: I don't think so. That's my personal opinion.

Liz Fell is a freelance journalist based in Paddington (NSW).

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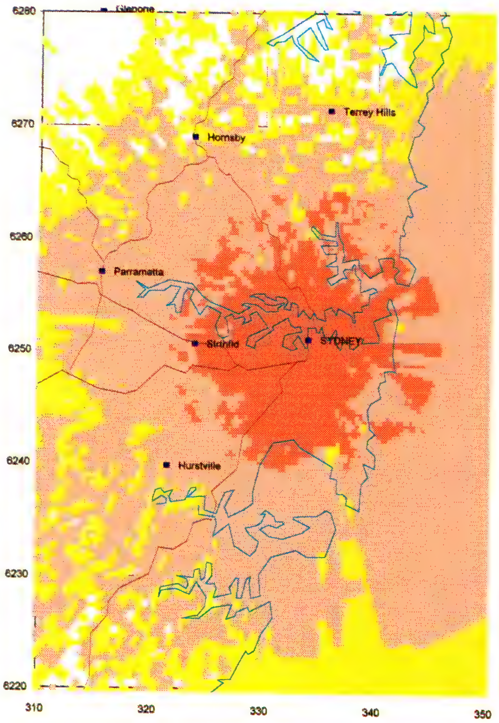
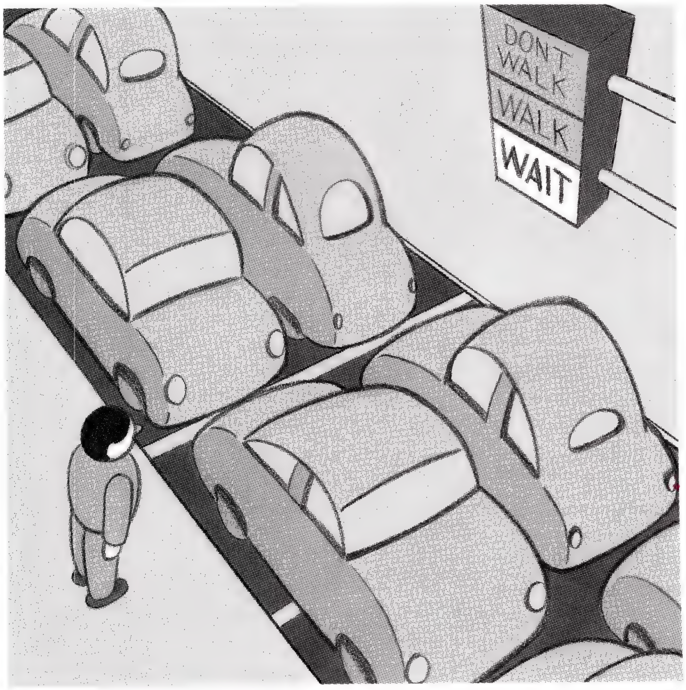


Richard Pascoe and Simon Gilchrist

Rights Turn on the Infobahn

The Copyright Convergence Group is about to report on possible reforms to the *Copyright Act* to deal with emerging delivery technologies. What are the problems which require resolution?

The Copyright Convergence Group was formed because, in the Minister's words, "it is time to deal with the consequences of the convergence of the telecommunications, broadcasting, computing, entertainment and information industries." The Minister said the Group would "consider proposals for amending the *Copyright Act* to cater for technological change," to ensure "a system which gives a fair allocation of copyrights and access in respect of transmissions over the air — be they broadcasts or narrowcasts, satellite, microwave — and cable transmissions."



The Federal Government's terms of reference required that the Group consider 'the adequacy and appropriateness of protection under the *Copyright Act 1968* (the Act) for broadcasts and other electronic transmissions and the underlying copyright materials used in those transmissions.'

The Group was directed to have regard to the fundamental changes which are occurring in the way in which copyright material is being used; the need to facilitate those uses while at the same time providing appropriate protection for copyright owners and a positive environment for the development of industry; and Australia's current international obligations.

Questions, Questions

In particular, the Group was asked to look at:

- The scope of the 'diffusion right' (in effect, cable rights) granted to authors of literary and other works and cinematograph films and the extent to which the rights of authors and the makers of films to control the electronic transmission of their works should be varied or extended;
- Whether owners of copyright in sound recordings and television and sound broadcasts should have an exclusive right to authorise cable and other electronic transmissions (in effect, should the owners of copyright in sound recordings and broadcasts have a cable right?);
- Whether there should be copyright in electronic transmissions which are not currently protected by copyright. In other words, should the signals by which broadcasts and other copyright material are carried be themselves protected?;
- Regulation of reception and retransmission of broadcasts; and
- Whether unauthorised use of secured or encoded transmissions should be regulated.

The Group sought and received comments and submissions from a range of interested parties including the film, music and recording industries, other copyright owners, and the broadcasters. The Group was to report to the Government by 30 June 1994.

Conflicting Interests

Traditionally, the main electronic providers of copyright material have been the broadcasters, but this class is now fast expanding to include so-called 'cablecasters,' narrowcast service providers (like home shopping, ethnic channels, in-store music and video services, professional services channels), and providers of subscription and 'on demand' services and data and information vendors.

The expansion in this class increases the policy tensions which underlie copyright law. On the one hand, copyright allows the owners of copyright material to control the use of that material, in order to prevent others from getting a 'free ride' on the copyright owner's creative and financial efforts. On the other hand, it is important that copyright law not unreasonably restrain the dissemination of services or prevent, for example, secondary retransmission of services where that transmission does not undermine the copyright owner's market. This policy tension is not new. It can be seen, for example, in age-old exceptions to the copyright owner's exclusive rights, such as 'fair dealing' for the purpose of reporting news or research or study.

However, there are new difficulties. As with most other legislation dealing with technological areas, the difficulties have arisen because the Act was not drafted to be change-orientated. To use today's fashionable jargon, the Act is not technology-neutral. In particular, it confers rights by reference to specific technologies. The drafting reflects a time when, aside from broadcast, the only way of widely disseminating copyright material was sale of the physical media embodying copyright material, such as records, tapes, films or video cassettes. As a result, the Act draws a distinction between the so called 'primary uses' of copyright material (usually defined as the sale of physical copies of the medium embodying the copyright material) and so called 'secondary uses' such as broadcast.

The Government has recognised that those distinctions are about to disappear. It is possible, if not likely, that the electronic transmission of copyright material such as sound recordings and films could replace the sale of compact discs and video cassettes as the primary means of distribution. Of course, this scenario is further complicated by the fact that use of digital technology allows for 'perfect' copies to be made from electronic transmissions.

Broadcast Issues

The Act defines broadcast as 'transmission by wireless telegraphy to the public.' There are two problems here — why should the definition be limited to 'wireless telegraphy,' and what constitutes 'the public?'

The answer to the first question is a historical one. When the provision was drafted the only 'broadcasters' were the free-to-air broadcasters who did and still do transmit their signals by wireless telegraphy. The *Broadcasting Services Act 1992* no longer makes the distinction between wireless and other delivery technologies, yet the *Copyright Act* continues to do so. Obviously, the emerging cable TV and cable radio industries will be engaged in 'broadcasting' as it is commonly understood.

The second difficulty is exemplified by the recent *APRA v Telecom* case, in which it was held that the provision of 'music on hold' to mobile phones did not constitute a 'broadcast' of the musical works. Although it was transmission by 'wireless telegraphy,' mobile telephone users did not constitute 'the public' for the purposes of the Act. Although this case is now on appeal, that decision was enough to cause the Minister for Justice to note that there was no reason why copyright owners in musical works should be unable to control a very lucrative use of their copyright material.

Diffusion Right

Owners of copyright in 'works' and cinematograph films have the exclusive right to control transmission of their copyright material to subscribers to a diffusion service. In effect, this is a cable right for works and cinematograph films. The right is not granted to the owners of copyright in sound recordings.

A diffusion service is one by which energy is transmitted over material paths (the cable). The real difficulty with the current formulation of the diffusion right lies with use of the word 'subscribers.' What is the relationship which must exist between the provider and the person receiving the copyright material, for the person receiving the material to be classified as a 'subscriber?' For example, free cable TV, where the revenue is generated by advertising, could not be said to be a diffusion service to 'subscribers' as the persons receiving the service do not pay a subscription fee. It is also to be noted that there is no reference to 'the public' in the diffusion right.

This opens up the possibility of a range of services provided by cable or a mixture of cable, satellite and MDS which are neither 'broadcasts' nor 'diffusions.' The effect of this would be that the owners of copyright material would have no way of controlling those uses of their copyright material.

The situation is even worse for the owners of copyright in sound recordings because of the complete absence of a diffusion right for sound recordings. There is, understandably, a great deal of concern in the recording industry that the imminent arrival of cable radio and other cable-based services delivering sound recordings to consumers will be totally outside the control of the owners of copyright in sound recordings unless the Act is changed to deal with these new technologies.

Possible Solutions?

The Copyright Convergence Group has the opportunity to propose arguably the most significant amendments to the Act since its inception. Undoubtedly, there are significant competing interests to be taken into account in trying to develop a copyright regime which allows copyright holders to control the financial exploitation of their products while at the same time allowing those products to be delivered to the public at a reasonable cost.

However, from the examples given above, it can be seen that what is needed is a broadly based, technology-neutral 'communication right' which would allow copyright holders to control and authorise the delivery of their copyright material by whatever technological means are employed. It should not matter that copyright material is transmitted by wireless, cable, optical fibre, microwave or any mixture of these technologies. The end result is that copyright material is being exploited for financial gain. To attempt to pigeonhole the various uses of copyright material into discrete categories, as the Act currently does, is no longer sensible.

Together with formulation of a 'communication right' there needs to be a definition of 'the public.' Obviously, an exhaustive definition is not possible, but as the *APRA v Telecom* case has shown, there is a need to ensure that lucrative economic uses of copyright material are not totally outside the control of the owners of that copyright material. This, after all, is what copyright is all about. Most importantly, there is no reason why the law in relation to one delivery technology should refer to 'the public,' while the law on another refers to 'subscribers.' It remains to be seen whether the Copyright Convergence Group will propose such a wide-ranging reform to the Act. No doubt the process of reform will involve a significant lobbying both on behalf of the copyright owners and the 'deliverers' of that material (the traditional broadcasters and the emerging pay TV industry).

However, even if it is thought too difficult in the short term to replace the broadcast and diffusion rights with an overall 'communication' right, there is clearly a need to align the current broadcast and diffusion rights to ensure that they are equivalent. This could be achieved by removing the reference to 'subscribers' in the diffusion right and replacing it with a reference to 'the public.' This, combined with an inclusive definition of the public, would at least ensure, in the short term, that the owners of copyright material would be able to control the use of that material regardless of whether that material was delivered by way of broadcast or by means of cable technology. However, it would be only a short term solution, as it would not cover deliveries by a combination of wireless and wire technology (such as a point-to-point satellite transmission combined with MDS technology and final cable delivery into homes).

Conclusion

Convergence of the telecommunications, broadcasting, computing, entertainment and information industries is resulting in increasing interdependence between those industries. Clearly, if adequate copyright protection is not afforded to the owners of copyright material there will be no incentive to produce that copyright material, as any others are free to use it without having contributed to the initial creative and financial investment. Like it or not, the companies which derive their revenue from the delivery of entertainment and information services to consumers must accept that the vast majority of the material they are delivering is and should be subject to copyright. There is no point in expending vast sums of money on delivery infrastructure if there is no incentive for people to create material for delivery.

There will always be arguments over the true rationale of copyright laws, however, while the debate continues, technology keeps moving. The Copyright Convergence Group and the Government should take this opportunity to set up a copyright regime which will facilitate the continued viability of the copyright-based industries, regardless of the delivery technologies which may emerge.

Richard Pascoe and Simon Gilchrist are lawyers with technology law firm Gilbert & Tobin. This column sets out their personal views and not those of the firm or its clients.

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Tom Amos

Lift and Separate

Suggestions that the price of a local telephone call will rise another cent seems a matter of course, until you start to consider why such a rise should occur when competition was supposed to be driving the prices down towards the underlying costs and when this business segment is already profitable. Surely there must be some underlying fundamental reason for such a rise, given the political resistance on payphones.

An old guide to the revenue effect of each local call unit was that each cent on the local call price added around $120 million net to the Telecom bottom line. Nice if you can get it! It is always good to have another $120 million or so, and, given the current overseas investment commitments, one can quickly see where such a revenue increase could be readily spent. But more of that later.

The recent mobiles decision by Austel which declared Telecom no longer dominant in the cellular mobile area (when clearly they still are) goes to the heart of accountability in the new marketplace in Australia. The concept developed by Austel to enable it to make this startling step was to allow Telecom to overcome the restrictions of the *Telecommunications Act* regarding dominant operators. In particular, the ability to selectively discount is opened up in exchange for a number of undertakings regarding separation of business and marketing and sales of PMTS.

There has already been much written on the impact of this Decision Making Framework (DMF). Suffice it to say that in exchange for the ability to compete, Telecom has the option to split the service supply from the retail sales and marketing of the PMTS product, with the service supply being available to all eligible retailers. This constitutes effective structural separation of the provision of the service from the sales to the users. Market competition occurs at the sales end of the business and all competitors have an equal right to purchase access and service on the carriage side. Effective business unit isolation.

This arrangement clearly underpins the Government's desire to avoid unnecessary structural duplication as embodied in the Act, and the Minister's undertakings at the time. The DMF rolls back some of the unfortunate developments of the early days of competition and sets the scene for 1997 and beyond. But to have much worth, accountability and obvious separation is needed in the various business areas, and this flies against the current determined Telecom approach to integrate all components of carriage and content and transfer the monopoly areas into an expanded service range.

After all, this GBE is 100% Government-owned and enjoys an ongoing infrastructure oligopoly, and the lack of public gaze has led to continued speculation on internal cross-subsidisation of a number of product areas and to suspicions among users about the service prices. For example, consider Telecom's overseas thrust, which has continued unabated for the last few years. Even at ATUG this year there was a continuation of this theme, with hundreds of deals over many countries being highlighted as the path towards the future — a global highway that spans the world and is owned and operated by Telecom. What was left out was the hundreds of millions of dollars accumulated loss that has been sustained in this area of activity. Add to this the announcement that many hundreds of millions of dollars will be committed to a start-up carrier in the Philippines, where Telecom is to be only a minority partner, and some alarm bells start to ring. While it may be a laudable aim to earn foreign revenues from operations in another country, it is hard to swallow when the rates at home continue to rise to indirectly fund such activities. I remain to be convinced that I should pay more for my local telephone calls today so some public servants can play at being entrepreneurs overseas. Who decides to call it a day and cut the losses, and where is this in the Government charter?

Industry development has been a key component of the overseas push, but surely there are better ways to go about this than losing money on most projects to cross-subsidise the industry into overseas opportunities. It is sad that the money already lost may never be recovered. The level of disclosure is such that the overseas exploits are bundled and lost in the accounts. The need for more accountability and a move towards structural separation of such business activities would definitely move the industry towards cost-related pricing and services that reflect their underlying cost structures. This can be only a good move considering the market opening in 1997.

We have a unique climate in Australia where there is an oligopoly of providers, and where the Government allows a GBE to act essentially as a private company while the shareholders remain uninformed. One would hope that the shareholders' representative is fully informed.

If you consider the overseas opportunities, our Telecom is really coming from a long way back. It is not a privately owned company or widely publicly held, it does not operate in its home market in a fully liberalised environment, and it is fully Government-owned. When compared to other overseas carriers seeking investment opportunities Telecom is almost unique, mixing it in the main with large foreign public companies, which must report to their shareholders on a regular basis. Of course it does not take too long in the real world to sort out the loss-making propositions and take appropriate action. Such a luxury does not exist in the Australian scene.

The question comes down to the expenditure of local revenue on non-local services and overcharging. It is clear that revenue collected in Australia from Australian services should be spent in the same service area and not on launching other services in other countries. Without the DMF and subsequent separation of the various business GBE elements, the user gains in Australia can be all too easily exported overseas. The cents do not make sense on money grounds, and such continued practices of undisclosed subsidisation and artificial price maintenance cannot end soon enough.

Tom Amos is a partner with telecommunications consulting engineers Amos Aked Swift.

John Craven

Solving the Chinese Puzzle

To say that the telecommunications industry is undergoing change is an understatement of large proportions. Deregulation, competition and the widespread deployment and convergence of new technologies which significantly impact speed, reliability and capacity is creating a potent new communications cocktail. The challenge facing Australia is to harness the forces of change to ensure that we join the wave of transformation which our trading partners and competitors are beginning to embrace.

Embodying this rapid change is the concept of the 'Information Superhighway.' If harnessed correctly, the superhighway offers a real opportunity to the customer as an individual and to the nation as a whole. It has the potential to change the way we use information at home and at work, and as a result it has the potential to change the distribution and very nature of goods and services and transform the structure of organisations, and, eventually society. Perhaps the most exciting opportunities for its use lie in China, a country which offers many unique opportunities for Australian industry to harness its tradition of innovation. But before local industry can capitalise on these and other opportunities, many significant issues need to be addressed:

- Should I position myself in the rapidly growing market for value-added services or is there a better place among the low-cost transport providers?
- What should I do to retain customer ownership in the face of new national and global competition?
- Will I need partners to succeed and how should I structure and manage my relationship with them?
- How can I effect the change while maintaining revenues in the short term?

These issues are creating massive upheaval within the incumbents and are at best unsettling for those who aspire to build a career in what everybody knows to be the fastest growing segment in the world. The response from industry has varied by country ranging from frenzied consolidation and investment (as has been experienced in the United States) to political and regulating restraint ahead of a clear way forward (as is presently demonstrated in China). But reviewing current and future needs in China leads to highlighting opportunities afforded to Australia in coming years.

China represents at once one of the world's most underdeveloped telephone infrastructures and the world's fastest growing and ambitious markets for telephone services. With growth rates in the past three years of 40% to 60% China already boasts over 30 million services and by 1995 the network will be largely digital — a state many countries, including the US, would envy. Plans published recently by the industry controlling body (the Ministry of Posts and Telegraph (MPT)) establish an annual growth rate of around 25% for the next ten years, which will see the network grow to over 140 million services. This growth rate roughly equates to adding a network the size of Australia every year for the next ten years. And that planned infrastructure will utilise the latest technology available. If successful, China will achieve in ten years what the US did in 50 years or more.

There is much speculation in China today regarding the relevance of a superhighway. I believe that it is not an option — rather, it is an imperative. However, it will arrive in China in a different way. For China, the information superhighway is more about the efficient and effective development of infrastructure on which to base global industries of the 21st century than it is about on-line computer games for the masses. For China the challenge is how to invent and reinvent the processes on which those industries will be built.

For example, in healthcare it could be asked why it's necessary to recreate the costly infrastructure the West is presently attempting to dismantle. China today has 2.8 million hospital beds and 1.2 million doctors for over one billion people. By harnessing the superhighway and integrating telemedicine with other related segments like insurance, pharmaceuticals and other patient services a 21st century industry could be created. In financial services work has already begun on the creation of new payment systems. Cheques as we know them do not exist and maybe they never will. In education, China faces one of its biggest challenges. Last year there were around 165 million students in primary and middle schools and about one million undergraduates. The information superhighway offers the opportunity to create knowledge networks at a corporate, local and national level to effectively leverage teaching resources. Finally, the efficient, timely and effective provision of government services in such a vast nation will only be achieved if information is shared and services are integrated. The information superhighway is the vehicle to achieve this.

Industry development in China must be rethought in terms of an integrated model which addresses at once strategy, technology, processes and people. Unfettered by the burden of legacy systems China will reinvent best practices. This is already evident in the so called 'Golden Projects' which are beginning to address this issue.

Australia has a heritage of innovation. As we address the Chinese market, it is time to rekindle that spirit. It is not enough to simply package up our 'best practice' and sell it or lease it to China. We need to adopt a partnership attitude, teaming with Chinese enterprise to raise the level of best practice to create unique solutions which address China's unique situation.

To date much of the advice provided to China from the 'developed' world has been provided by product vendors seeking new markets. In the future a key role will be played by systems integrators capable of harnessing the best in the world and repackaging it to meet China's needs. This will be a difficult process requiring time, investment and creativity, but the rewards will be great for those who can work with China to harness the transformation opportunities of the superhighway.

John Craven is Managing Partner, Asia-Pacific Area Telecommunications Industry, for Andersen Consulting.

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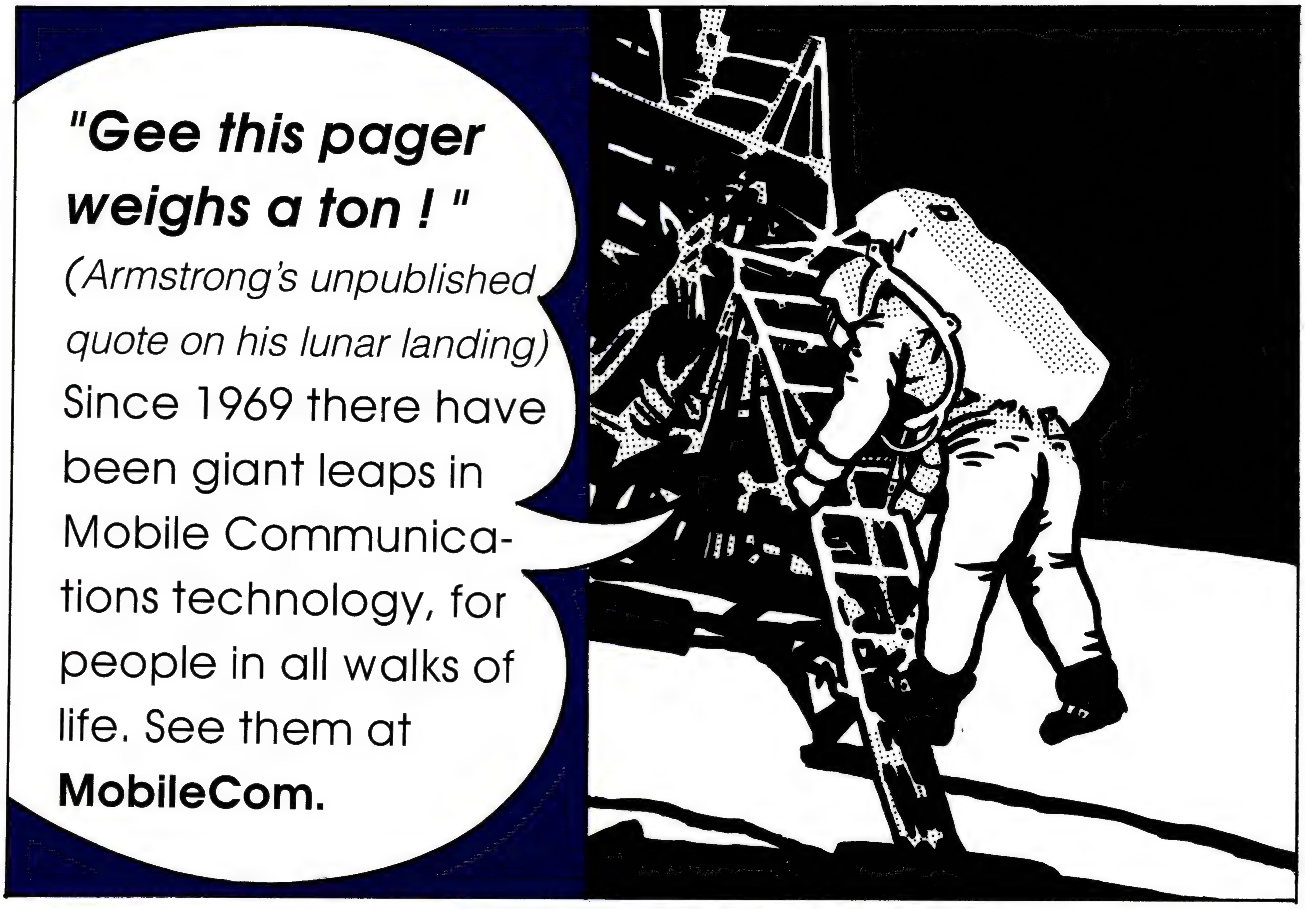
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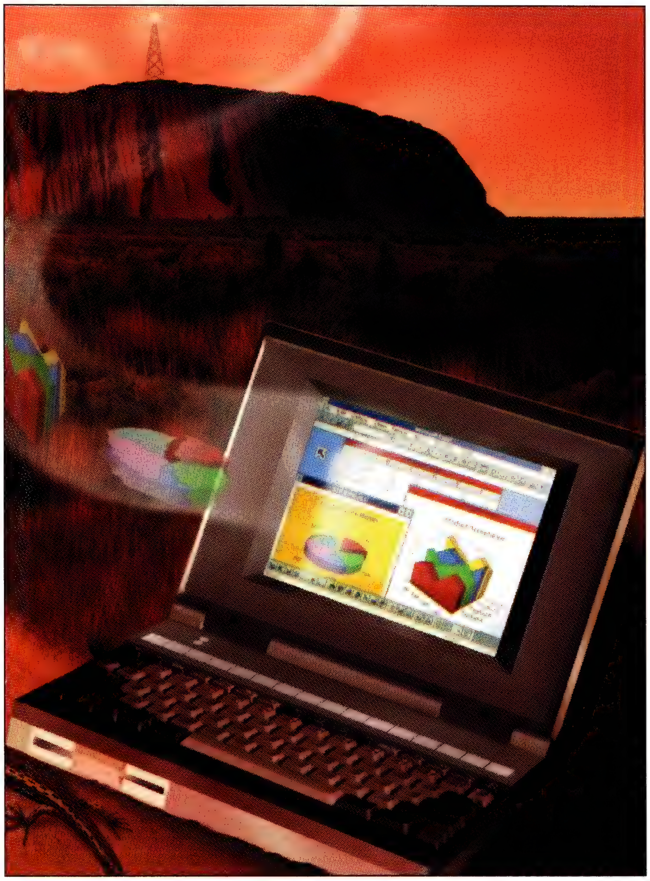
Mobile Data: Welcome to the Enterprise

With the launch of BellSouth Mobile Data and Telecom MobileData, Australia now has two public mobile data networks. What do these networks offer and how do they compare with alternative technologies?

Until now wide area wireless data networking has been available to only a few users. These were corporate road warriors who cut the cable a few years back and used wireless for faxes, electronic mail and file transfers. Also transportation, emergency services and couriers pioneered mobile data communications for vehicle location, dispatch and tracking. But, due to advances in technology, availability and cost, wireless mobile data is now attracting far more interest. As recently as the late 1980s it would have cost anything up to $30,000 to equip a single user with the mobile computer equipment and transmitter/receiver needed to operate on such a network. The user would not have been very mobile either, as the circuit and battery technology dictated in-vehicle installation, or very heavy mobile equipment with limited battery life.

Today we have far more compact notebooks, Personal Digital Assistants (PDAs), Pen PCs and application-specific terminals with long battery life. The transmitters/receivers (radio modems) are now the size of a small mobile phone, and will shortly be available as PCMCIA cards. Some equipment has in-built modems. The effect of this technology change is that users can now be equipped with truly portable and usable equipment for a few thousand dollars.

Network technology is also more diverse, with many public services becoming available. These public services make wireless data available to a broad base of users, who will not need to operate their own base stations. They now have the option of trunked radio systems, such as Telecom's Fleetcoms, satellite services from Telecom and Optus, paging services using current paging operators or integrated with digital mobile phones, modems on cellular phones, and the new mobile data networks. As a result, a mobile data boom is about to hit and hit big. In the US, market research firm BIS Strategic Directions predicts that from modest beginnings of $US289 million in 1992, the US wireless data market will reach $US756 million this year ($US508 million in services and $US248 million in equipment) and $US2.98 billion by 1998.



A Worldwide Trend

Several technologies can be and are being used to provide wireless data services, including packet networks, satellites, trunk radio, circuit-switched cellular and packet-over-cellular (see 'A Wide Angle View of Wireless Data' on page 60). Of these, the most successful so far in terms of applications and users has been the packet approach pioneered by Ericsson and Motorola. Under this approach, data is transmitted in packets with many mobile users sharing the same frequency. Base stations with antennae are spaced at 10 to 30 kilometre intervals and have different frequencies allocated for outgoing and incoming packets, with the modem serial number identifying the source or destination of the packet. Packets are typically up to 500 characters each, with larger amounts of data being sent as multiple packets. Costs are kept down by being based on a packets per month basis, with no charge for the time the modem is switched on, ready to send or receive.

A Wide Angle View of Wireless Data

Wireless data services can be broadly lumped into two main categories: land-based and satellite-based. The former include packet networks like those offered by Telecom and BellSouth, circuit-switched cellular services, trunk radio and packet-over-cellular technology.

Each approach relies on different products and is optimised for a specific set of applications. Some schemes are most appropriate for paging and other one-way data broadcasts; others are optimised for in-building coverage; still others are designed for short, bursty messaging rather than sustained file transfers. While the packet network approach is probably the most widely used, other technologies are worth looking at.

Circuit-Switched Cellular

The big advantage to circuit-switched cellular is availability. Nearly any analogue cellular service can be used to transport data, as long as the subscriber has the appropriate equipment — modem, interface or cable (if needed), and cellular phone. What's more, data rates for circuit-switched cellular are limited only by the speeds of the modems at either end of the link; theoretically, at least, that means 14.4Kbps is possible — however, in practice, 2.4Kbps is the best that can be hoped for. Further, circuit-switched cellular is more efficient than packet services for long files (such as spreadsheet documents).

But there are two big drawbacks to cellular data transfers — reliability and complexity. The signal-to-noise ratio on a cellular link may be so low that the modem has trouble establishing a connection. And connection quality can vary dramatically over the life of the call, as users pass through several cells or objects temporarily block RF signals. A connection may suddenly improve, in which case the modem should be able to bump up the data rate. Or it could deteriorate, which would require the modem to downshift so that the call isn't lost. The fading, adjacent channel interference and transmission problems associated with calls on other cells using the same frequency can make for chaotic high-speed links.

Most modems have a tendency (especially at higher speeds) to hang up when they encounter these types of transmission difficulties. They will also often hang up if the carrier is lost for more than 1.3 seconds. Microcom has designed its MNP 10 error correction protocol with this problem in mind and it's designed to keep the modem connected. The company claims that MNP 10 can withstand five second dropouts during hand-off and fades without losing the connection.

Digital networks promise a better deal for circuit-switched cellular users, but the GSM networks now in place are intended only for voice — standards governing data facilities are still being developed. When those facilities are in place, GSM-based networks will offer data transmission rates up to 9.6Kbps.

Satellite Services

Satellite services are mostly used for unidirectional paging and bi-directional stationary transmissions. Systems for mobile communications based on satellites are well proven, and popular in maritime and remote terrain operations, but to date they have proven to be too expensive, and the equipment cumbersome.

In May, Telecom launched its new digital Satcom-B service which uses Inmarsat's global network of geostationary satellites to provide voice and fax communications across the country and internationally. Usage rates for what Telecom calls high quality voice and data communications 'such as facsimile, circuit-switched data and telex' peak at $4.50 per minute to anywhere in Australia/New Zealand.

Many other satellite-based services are mooted (see 'Around the World in Different Ways' starting on page 69), including Optus's Mobilesat, which may enter service later this year.

Trunked Radio

Trunked radio was originally developed for voice, but it can support overlay packet data as well. These systems are mainly used by fleet operators, such as taxis or couriers or emergency services as in police or ambulance where the user does not wish to establish and operate a network. Telecom's Fleetcoms service is leading example of the technology in Australia.

Trunked radio sounds more complex than it is. 'Trunking' simply means the allocation of channels on demand to those who wish to use them. To convert 'two-way' radio to a trunked system, you first need to add intelligence to the base station(s) and each mobile, and design a signalling standard to automatically switch channels. Other proprietary features are usually included in the form of one-touch call-up and messaging from the mobile so that the driver isn't too distracted.

According to market researchers BIS Strategic Directions, trunk radio accounted for just 2% of all US mobile data revenues in 1992.

Checking Out CDPD

At this point, public packet networks and circuit-switched cellular pretty much exhaust the options when it comes to bi-directional wireless data transfer. But CDPD (Cellular Digital Packet Data), a new technology now being pursued in the US is — according to its backers — likely to prove more robust than cellular data and (in the US) cheaper and more widely available than packet networks.

The technology has been developed by a consortium of eight US cellular providers and is now being trialled by Ameritech Cellular Services, Bell Atlantic Mobile and GTE Mobilenet, while McCaw Cellular and Pactel have started services. Note that CDPD's popularity owes as much to the US regulatory regime as it does to anything else; there are currently no plans to introduce CDPD in Australia.

Public mobile data networks based on this technology are currently being installed in many countries in the world, and in Australia we have two: BellSouth Mobile Data and Telecom MobileData.

Telecom is using Motorola technology which was developed in liaison with IBM in the early 1980s. The first network was for use by IBM's service engineers to receive service calls and request parts or assistance. This network was converted to public use in the early 1990s, and is marketed in the US as the Ardis network. Coverage extends to most of the US, and users number 34,000. Motorola refers to its equipment family as its InfoTac product line.

BellSouth is using Ericsson technology which had its beginnings in Scandinavia. Early implementations were used for remote weather monitoring stations and for alarm reporting systems for remote workers. In the late 1980s the early implementations were commercialised and marketed as Mobitex.

There are now many networks in the world, representing an even mix of both vendors. RAM Broadcasting and BellSouth built the RAM Mobile Data network in the US, based on Ericsson technology. To this can be added another 13 networks in 12 countries, including France, Belgium, the UK, the Netherlands, Chile, several Scandinavian countries, as well as Australia.

The Ericsson network operators have formed a powerful user group, called the Mobitex Operators Association (MOA). This group own the Mobitex standard, and in liaison with Ericsson, dictate new releases of hardware and software. This ensures backward compatibility, and that user needs are addressed. The MOA has recently announced international roaming. With this

Wireless Options

TECHNOLOGY	ADVANTAGES	DISADVANTAGES	APPLICATIONS	PRICE AND DATA SPEED
Cellular telephone with modem	Good network coverage. Good for bulk data. Interoperates with wireline	Expensive for time. Circuits sometimes do not establish or drop out	File transfers, faxes. Any application with bulk data	50-cents-plus per minute. Depends on contract. Analogue 2,400bps normal; Digital 9,600bps normal
Mobile data	Good for occasional short bursts of data. Robust. Store and forward capable	Expensive for bulk data. Limited coverage at the present	Telemetry, EFTPOS, e-mail, AVL and dispatch, field service and sales	$25-plus per month. Depends on data volume and facilities used. 5Kbps to 14.4Kbps
Conventional or trunked radio	Voice and Data circuits available. Good for bulk data	Expensive for time. Circuits can drop out	For large vehicle fleets with mainly voice and some data	Priced on a per-fleet basis. Cheaper than using mobile phones. 2,400bps to 9,600bps
Paging (including digital mobile telephones)	Cheap terminals and data charges. Store and forward capability	One way only. Short bursts of data	Messaging to field personnel	Can be less than $20 per month. Speed not relevant
Geosynchronous satellite (Telecom Satcom-B and M, Optus Mobilesat)	Voice and Data circuits. Coverage allows remote locations and marine use	Expensive for time. Equipment bulky	All voice and data applications in remote areas (mining, construction, marine)	$1.60 to $4.50 per circuit minute. 2,400Kbps to 19.2Kbps normal; higher speeds available

Simply put, CDPD is a way to upgrade cellular networks to handle packet data. Cellular carriers install two pieces of equipment at their central office sites: a Mobile Data Base Station (MDBS), which retrieves data packets from the wireless network, and a Mobile Data Intermediate System (MDIS), which routes them. Since both devices connect to the cellular base station's antenna, CDPD is sometimes described as a piggyback or overlay network.

The basic idea behind CDPD is to send packet data on unused voice channels on the cellular network. Data from the transmitting device (a laptop computer, for instance) is segmented, encrypted, and formatted into 138-byte frames by the CDPD subscriber device. These frames are sent over one of the 30kHz channels in the cellular network using a protocol called digital sense multiple access with collision detection (DSMA/CD), which is similar to the CSMA/CD protocol used with Ethernet. The transmitting device listens to find an empty channel; if there is one, it transmits the frame immediately. If not, it waits until the channel is free.

The frames are picked up by the MDBS and handed off to the MDIS. They're either sent to a wireline network or passed on to another mobile user. To ensure that the frames arrive in the correct order, CDPD calls for higher-level IP protocols.

At 19.2Kbps, CDPD competes with the fastest packet networks and circuit-switched cellular links. What's more, CDPD features unsurpassed security. Unlike the Ericsson and Motorola technologies offered by BellSouth and Telecom, which both require applications to have their own security schemes, CDPD furnishes security at the network layer. Subscriber devices encrypt data before it's sent out over the cellular network, so there is no way for eavesdroppers to pick up passwords or login information.

In fact, it's impossible for CDPD subscribers to send unencrypted data over the network. When a CDPD device receives data from a laptop, say, it's encrypted before it's even formatted for transport over the network.

CDPD and other packet technologies are definitely more reliable than cellular services. Because the wireless environment is exceptionally tough on data traffic (problems like signal fading and cell handoffs can negatively affect reception), packet technologies are more effective for transporting data, because only packets that have been lost or corrupted need be retransmitted. Further, CDPD uses a highly reliable form of forward error correction called Reed-Solomon encoding, which can correct for cases in which multiple bits are lost or corrupted.

But there's no reason to believe that CDPD is innately more reliable than other packet schemes; both the Telecom and BellSouth services also use a form of forward error correction encoding.

Mary Jander

facility a user on a business trip can use the Mobitex network of another country for e-mail back to his/her home base, and have the charges added to his/her local bill.

Motorola has networks in many countries including the US, Canada, UK and Germany. Of interest to Australia is the Asian market where Motorola is represented in Singapore, Malaysia, Thailand, Hong Kong, and (just announced) in Korea.

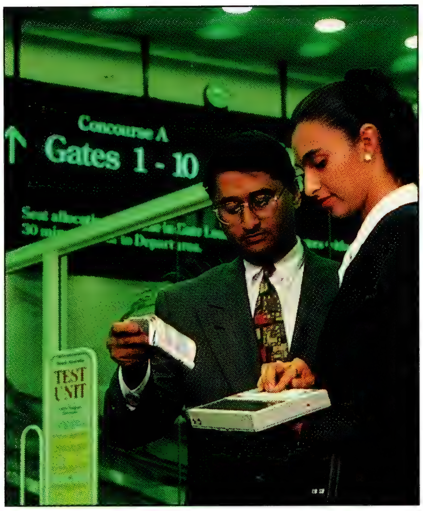
A cooperative group called AsiaPAC has been set up representing the Australian and Asian networks. The cooperation between the networks reduces development costs and will allow common services. It is hoped that roaming across AsiaPAC networks will be announced at some time. AsiaPAC operates under the auspices of the World Wide Data Network Operators Group. This group performs the same function as the Mobitex Operators Association, however it has not been in operation for as long.

The only other player is Racal in the UK, which has an interesting system called PacNet. This is a cell-based wireless system where the base stations feed data packets back into established X.25 networks. The system does not include the ability to roam from cell to cell, but this has the advantage of making the field devices cheaper.

Who Uses These Networks?

There are countless applications which can be applied to mobile data technology, and they fit into specific vertical markets and horizontal applications. Counted amongst the vertical markets are fleets of service vehicles and personnel, courier and dispatch, EFTPOS, telemetry, plus many more.

Telecom's first corporate customer in Australia is Bull HN Information Systems. Bull has an extensive customer base in the



Airport check-in and information services are shaping as key mobile data applications

area of third party maintenance where it services some 24,000 customer sites, including GIO, Westpac, AMP, ANZ and Queensland Treasury. Service engineers will receive full details of the customer site, the specific problem, diagnostic aids, and an inventory of parts already dispatched to site via the mobile data network. This information can be received automatically by the engineer, even if he is driving or otherwise occupied.

In the UK, Heathrow Airport uses the Ericsson technology extensively. Applications include checking in passengers on arrival, or on coaches or trains en-route to the airport, freight handling and in engineering and overhaul areas.

Mobile data will allow many organisations with smaller vehicle fleets to enjoy the benefits of Global Positioning Systems (GPS) and Automated Vehicle Location. These systems use satellite navigation receivers in vehicles to precisely locate that vehicle. The GPS needs only be connected by RS232 to a radio modem, and can then transmit it's longitude and latitude at regular intervals. Fire and ambulance services have used their private radio systems to do this in the past; smaller users can now use public mobile data networks.

Central systems are available from suppliers such as Intergraph. These systems then allow the GPS and AVL systems to be integrated into Computer Aided Dispatch and Intelligent Vehicle and Highway Systems (IVHS). It is mobile data which makes this technology economically viable to the small fleet operator.

Other applications include parking police, who can check for stolen vehicles and unpaid fines; and EFTPOS for temporary markets and events.

But e-mail remains everyone's best tip as mobile data's major horizontal application. A new company, RadioMail, has been established in the US to offer e-mail over mobile data. It allows access from both Motorola and Ericsson networks, and interworks with other networks such as AT&T Mail, CompuServe, MCIMail and Sprintmail. This has a ready market with travelling executives, sales and service staff.

In Hayes AT mode the radio modems can emulate normal PSTN dial-up modems. The advantage is that current computer applications that support a range of dial-up asynchronous terminals can be accessed by mobile users without changes to the application. Care should be taken that the application being used does not require too many small interchanges of data, as this reduces performance and increases cost.

A Packet For Your Thoughts

Packet networks like those provided by Telecom and BellSouth are robust and well-suited for bursty data traffic. And because they are not circuit-based, they can often be much cheaper. By comparison, circuit-based competitive satellite, mobile phone modems or trunked radio technologies charge on a per minute basis. These technologies are suited to specific application areas but do not suit small amounts of occasional data. Paging systems, either from paging suppliers or digital mobile telephone network providers, can suit this purpose but they are mostly one way only.

Circuit-based systems are also more sensitive to link failure — requiring file transfers to be commenced from the beginning or from the last checkpoint after the circuit has been re-established. Market researchers The Yankee Group report that this can happen in up to 20% of cases.

Packet-based mobile data networks have an advantage in that they treat each packet delivery as a discreet operation. If contact is temporarily lost with the mobile device several attempts will be made to deliver the packet before giving up. This greatly reduces the chance of the application being aborted before completion.

Circuit-based systems are also expensive in that an active user has 100% of the use of one frequency on one antennae or satellite at one time, and pays for it. This is ideal for voice communications, where an uninterrupted frequency is required, but is not suited to most data applications. A typical data application will send or receive a small amount of data occasionally. This may be an enquiry into a host and a screen reply back, or client/server data each way. During the time where the user is still logged on, and no data is being sent, the circuit is still allocated to that user.

How it Works

In both the BellSouth and Telecom packet networks, the first transmission is typically over an RS232 interface from the portable computer device to the radio modem. This is normally at speeds of 9.6 or 19.2Kbps, but will be faster in future when new PCMCIA cards become available. The modem then encapsulates the packet in a radio protocol and incurs a delay in waiting for a timeslot to transmit into the nearest cell base station.

Transmit time to the base station is a function of packet size and transmission speed. With the Telecom network this is 14.4Kbps net out of a gross of 19.2Kbps (the lost bandwidth is due to framing and control bits). BellSouth's system has a gross transmission speed of 8Kbps and a net of 5.1-Kbps. Transmission time is increased with congestion which is caused by a number of portable devices contending for the same frequency on the same cell base station.

The modem will roam from one base station to the next as it moves out of range of one (weaker signal) and closer to another (stronger signal). If a base station has multiple inbound and outbound frequencies it can instruct a modem to change frequencies. This occurs when one frequency is heavily utilised, and another relatively free.

Regular congestion is overcome by network operators either opening more frequencies in a cell, or installing more antennae and base stations, and making each cell smaller. In this way the apparently slower, 5.1Kbps BellSouth network could perform as well as the Telecom 14.4Kbps system. Obviously, with the same number of frequencies used, and the same traffic, the Telecom network would be faster on this leg.

From the base station the packet is transmitted over the public network to the user's target host computer or a public packet network such as Austpac.

From any cell base station, the outbound packets for different users can be sent one after the other on the same frequency. BellSouth use frequencies in the 400MHz range, and Telecom at 800MHz. Packets are identified by modem serial number, and a modem will only receive packets destined for it. Security is assured, to a reasonable commercial standard, as a modem's serial number is not changeable by the user, and the circuitry to encode and decode the signal is quite complex and only available under licence. Additional security is offered by the application encrypting the packet contents.

Inbound packets need to share bandwidth with other users in the same cell. The networks use quite complex techniques which are a combination of polling/token passing with priorities, and contention, for allowing users to transmit inbound. Polling or token passing by itself is inefficient on bandwidth in lightly loaded networks, due to most of the traffic then being polling or token passing. Contention by itself is inefficient in heavily loaded networks as most of the traffic is collisions; consequently, a combination of both techniques is used.

The host application can also request of the network whether a specified device is

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Performance and Application Design

The performance of mobile data networks does not readily compare to other computer networking technologies which are either circuit or packet-based. Circuits, as used with modems over the PSTN or cellular networks, satellites or trunked or conventional radio, offer the computer device a dedicated bandwidth with minimal delay. Even the delays on satellite systems are only a quarter of a second, and predictable. Packet data networks such as IP and X.25 have predictable end-to-end delays which are not usually critically significant. But mobile data networks have longer and more unpredictable delays due to their staged nature.

There are many steps in transmitting a packet of data from the remote device to a head office computer or vice versa. Each of these steps is performed sequentially, with error checking after each step, and retransmission if the packet has incurred a transmission error on that step. This includes computer-to-modem, modem-to-base station, terrestrial transmits between base stations, and X.25 or IP network times to the host computer. Add the issues of speed, roaming and congestion mentioned elsewhere in this article and delays can build up.

Field experience shows variable packet delivery times and during normal operation packet delivery times of two to three seconds one way can be experienced. It should be noted that where the message is too large for one packet and is broken into two or more packets, delivery time will not necessarily be a multiple of that time. The second packet will be going from portable device to modem while the first is going from modem to cell base station. This overlapping of operation means that one packet may take two to three seconds, but two packets would only take three to four seconds.

These issues give a potentially long turnaround time from remote device to central computer and back again, or vice versa. This is not an issue when notifying a service engineer of his next call, but for interactive applications it can have an impact on the user, and can lead to frustration. The answer is to design the application to be transaction-based, rather than interactive.

For example, an order entry application which requires a response from a remote central database of product description, stock on hand and price after the entry of each new part number would entail a new transmission for each part number entered. A better approach would be to equip each remote portable PC with a regularly updated parts database which could process each entry locally before transmitting the entire order to head office for confirmation. If it were not possible to have the database on the notebook, limiting transmissions to one per line would be a compromise.

This is along the lines of current client/server application development, where as much processing as possible is performed on the client, in this case remote notebook PC, between accesses to the server.

Remote LAN access is possible from mobile devices, however care should be taken in selecting the application to be accessed. Most LAN operating environments, such as NetWare, need to be carefully configured or they can create a needlessly high network load. This load is caused by too many protocol and routing messages. This is unimportant on high bandwidth LANs, and even dedicated lines but is a problem on low bandwidth mobile networks with transmit delays.

Host access can also be problematical and many older applications use many interactions between terminal and host, often with one character transmitted at a time. The answer is to make the applications 'radio aware' using the protocols which are implemented in software drivers, as discussed below. These allow the application to transmit and receive packets in a controlled and network efficient manner. Additional features are available using these protocols, which make applications more efficient and robust, and more user friendly. The modem can report to the attached computing device that its battery is low, or it is out of range of a base station, and a meaningful message can be displayed on the screen.

IBM and Digital users are in a better situation than other proprietary host users. Ed Lazarus of the IBM Asia Pacific Wireless Mobile Group advises that IBM's RadioPac software is now available for the AS/400 range, and these drivers operate on both the Telecom and BellSouth networks. At ATUG'94, IBM demonstrated a suite of field sales software which is an excellent example of the client/server approach applied to radio. IBM will be making available software for its MVS mainframe range shortly. Mike Bell of DEC also advises that that company's driver software will be fully available shortly.

Because of the consistency of Ericsson's Mobitex technology, software from any Mobitex network should work in Australia so, at present, BellSouth has more software available. BellSouth also has arrangements with several systems integrators including Whitesmiths Australia, which has developed communications drivers for the Apple Powerbook and Newton, and Blue Sky Communications, which supplies Lotus cc:Mail connections, among other services. Telecom is also developing relationships with systems integrators, two of the largest being Ferntree and Praxa.

Kevin Slatter

within range, or whether a message has been delivered. To save the effort of writing these protocol messages into every application, software drivers are becoming available. These drivers are implemented between the application and the modem at the remote end, and between the application and X.25 or TCP/IP software at the host end. At each end the drivers use an API set to communicate with the application.

Most remote end drivers are for DOS systems, but Windows and Mac-based versions will become available. The host end drivers are more difficult to acquire, although many implementations use the DOS drivers on PCs to front end hosts, and Unix drivers are becoming available. (See 'Performance and Application Design' above.)

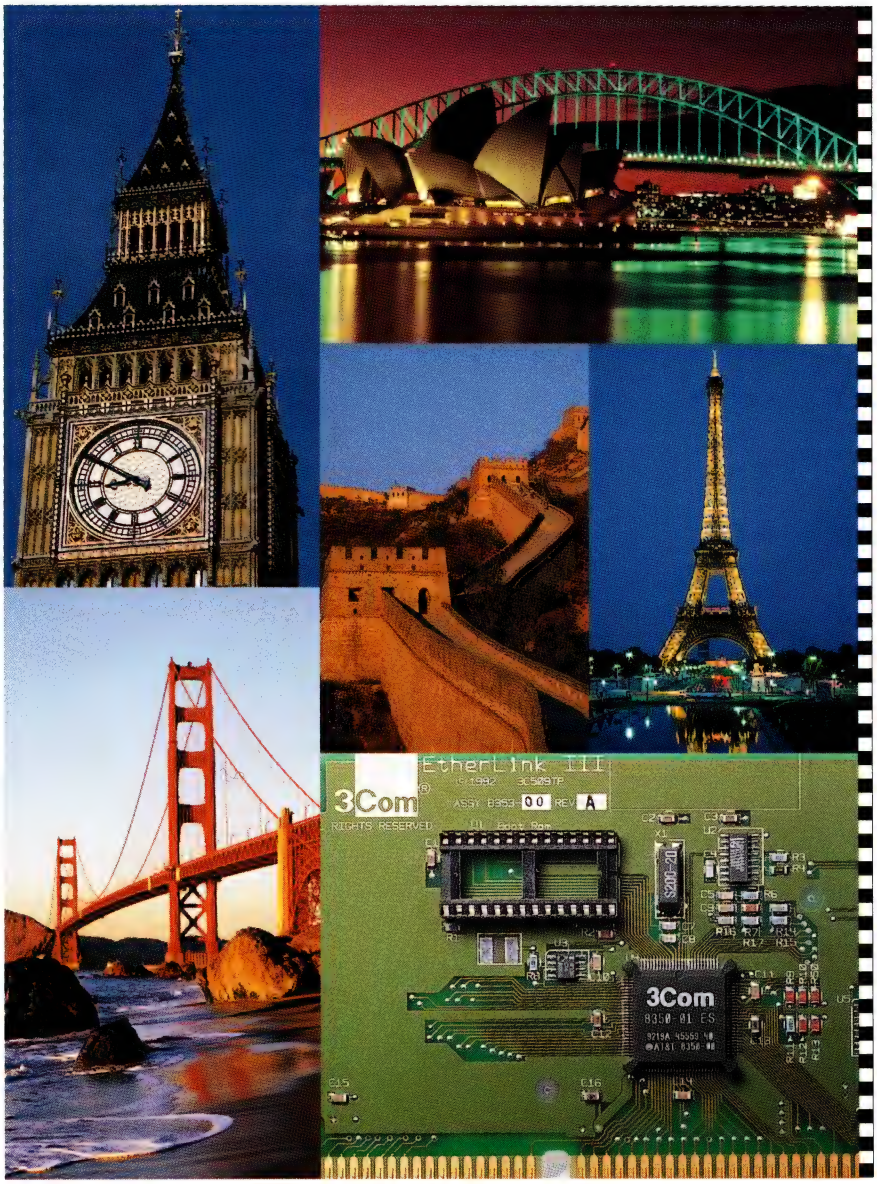
Terminal Issues

Networks and software are not much use without a terminal device at the remote end. The most common are standard DOS-based portable, notebook and palmtop PCs and, more recently, PDAs like Apple's Newton.

An exciting innovation in modems is being developed by Rockwell which has a new chipset with a standard V.32 modem operation, as well as the Mobitex radio protocol. This chipset, when implemented on a PCMCIA card will allow users to communicate over a Mobitex network where available, and to operate as V.32 dial-up over the PSTN when out of radio range.

Motorola has released its new Envoy personal communicator in the US. This device, with the size and functionality of a PDA, has in-built wireless and wireline modems. This is based on General Magic's Magic Cap operating platform. General Magic's charter is to develop personal intelligent communications products and to license these. They have partnerships with industry heavyweights including Apple, AT&T, Motorola, Philips, and Sony.

For specific applications there are many new terminals becoming available. Psitech of Queensland have the Psion range now in Australia. These include many handheld devices for order entry, stock taking and similar applications. Some of these devices have in-built modems which saves the inconvenience of a separate radio modem and RS232 lead.



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We are all now familiar with the new terminals used in taxis. These and other devices for in-vehicle mounting will become more popular, using either private or public networks. EFTPOS is an interesting application for mobile data, the transaction being completed faster due to there being no need for the dial up and link establishment process. Wang has demonstrated a range of portable EFTPOS devices.

Telecom or BellSouth?

How can you choose between Telecom and BellSouth? In network coverage, BellSouth is marginally ahead. It has Sydney and Melbourne covered, and will have a presence in Brisbane, Perth, Canberra and Adelaide by the end of the year. Telecom is not far behind in national coverage, and due to the same Motorola technology being used in many Asian countries, has better regional opportunities. If either gain a corporate customer that wants Hume or New England Highway coverage, or needs coverage in Wollongong, Newcastle or Geelong, they will accelerate their rollouts in those areas — or so the marketing departments of both companies are at pains to point out.

Technology varies, with Telecom having a marginal performance advantage. BellSouth has a mailbox facility which allows delayed delivery of a message. Should the mobile device be out of range or turned off when the message is sent, it can optionally be stored in a mailbox and delivered when the mobile device again makes contact with a cell base station. This is particularly handy when the mobile device is in a tunnel, or travelling at the fringe of the coverage areas. Whilst both networks allow host computers to be connected using X.25 over public packet switched networks or dedicated circuits, only Telecom has native TCP/IP connection. This allows direct access to the Internet, or to a host TCP/IP site.

Tariffs are competitive. Telecom's vary from $25 per month for 25 kilobytes and 10 cents for each additional 100 bytes up to $100 per month for 160 kilobytes and 6 cents for each additional 100 bytes. BellSouth to date only quotes a packaged mail service at $130 per month with unlimited data. For users with occasional small amounts of data, these are much cheaper than PSTN or mobile phones with modems. Prices for host computer connections are additional and will vary depending on whether a dedicated line or the public packet networks are used. Deals can be done for fleets, and prices will change over time if one shows an advantage over the other.

The CDPD Question

Improved satellite services and CDPD, a new technology which operates over existing cellular networks, loom as the main challengers to the existing wireless data order (see 'A Wide Angle View of Wireless Data' on page 60). Of the two, CDPD (Cellular Digital Packet Data) has the most immediate potential.

CDPD uses free circuits on AMPS or digital mobile telephone networks for data. The circuits allocated to data are used in a similar method to Motorola/Ericsson systems — contention for sending and charges on a per packet basis. This combined mobile data and phone network at a low investment cost has obvious appeal, and it also overcomes the problem in the US that there are not enough frequencies available for operators to have national data-only networks.

Will we see the technology in Australia? The issue is, do we use additional capacity in our mobile phone networks to add CDPD, or use the extra frequencies for data exclusively? Furthermore, Australia has the same frequency ranges available as the US, but without the population pressures.

As pointed out by Stuart Palmer, Business Development Manager for BellSouth MobileData, both BellSouth and Telecom would move to CDPD in Australia if it were proven to be the right choice at that time. But for the present, they are installing proven technology in available bandwidth capacity — which seems better than delaying or taking a gamble on unproven technology.

Where To From Here?

Currently one person in 16 in Australia has a mobile telephone. The figure is higher among those who work compared to those who don't. This indicates a mobile workforce, and is supported by a recent Yankee Group survey of US and Canadian workers. In this survey, 14% of those questioned reported spending six or more days in an average month away from their primary workplace on business. A further 37% spent from one to five days away per month. There is no reason to believe an Australian or Asian survey would not produce similar figures.

These are the potential users of mobile data networks, and the applications they require are many and varied. The same Yankee Group survey indicates a high number of US companies planning to implement applications over mobile data networks. The Australian market is starting a few years after the US, but there is no reason to believe the uptake of this technology here will not be as enthusiastic.

Kevin Slatter is a data communications consultant based in Sydney, NSW. He conducts regular courses on mobile data, frame relay, X.25, and other communications technologies for Housley Computer Communications.

In the August edition of

AUSTRALIAN communications

VIDEO-ON-DEMAND
Video-on-demand is generally seen as the service which will turn all of the information superhighway hype into reality. The problem is that the technology to actually deliver these services is still largely on the drawing board. Next month we examine developments to date.

REMOTE ETHERNET BRIDGES
Our tests of remote Token Ring bridges in our June edition found a big gap between data compression promises and performance. How do remote Ethernet bridges fare? Next month we test products in this important category from six vendors.

TOKEN RING NETWORK DESIGN
The days of plain vanilla Token Ring network designs are long gone and network managers now have many technology options to choose from. In our next edition, we examine the new range of Token Ring network design choices now becoming available.

INTERNATIONAL CASE STUDY: SKF
Sweden's SKF is a global manufacturer with operations in over 40 countries. Like many large companies it was faced with the chore of moving its mission-critical SNA traffic onto a global router backbone. In a special report next month, we find out how the task was undertaken.

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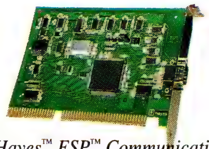

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Stewart Fist

Around the World in Different Ways

Two years after we first looked at the race to produce the first global mobile communications system, Stewart Fist provides an update on what are still essentially bold ideas in search of concrete backing.

Is it really that long ago? Back in the July 1992 edition of *Australian Communications*, our cover story looked at six proposals that were then being touted for satellite-based personal mobile communications systems (see 'The Global Mobile Communications Race'). The announcement of Motorola's plans for Iridium had kicked off the public interest in low-earth-orbit (LEO) satellites and revealed the potential for direct satellite communications from a cellular-phone-sized handset. Digging deeper into the subject, we found that Motorola had a lot of competition — at that time we found Globalstar (Loral and Qualcomm), Odyssey (TRW), Ellipso (Ellipsat), Celsat (Celstar), Project 21 (Inmarsat) and Australia's own entry Mobilesat, (Optus).

Actually Mobilesat is the odd-man-out here, because it depends on existing satellites in geostationary orbits (GEOs — using the L-band transponders of the B-series), and it turned out to be a co-operative venture with American, Mexican and Canadian partners sharing the development costs. NEC was making the mobile equipment, and the problems seemed to be largely those of getting the gear simple enough to be affordable. Handsets have been quoted in the $10,000 to $7,000 range.

In America, the company concerned is American Mobile Satellite Corp. (AMSC) which has recently said it will be offering the Skycell Mobile Telephone Services sometime in 1995 — which confirms Optus's dates. AMSC is backed by Hughes Communications, McCaw Cellular Communications, and Mtel Corporation, to name just a few, so it isn't to be treated lightly — although the technology that Aussat/Optus has been showing seems well out of date. AMSC was the first recipient of an FCC licence to provide a full range of 'satellite-delivered, mobile telephone, fax and data services to land mobile, maritime, aeronautical and fixed site markets.'

So, two years later, what's happened to all the other MSS (Mobile Satellite Services) schemes?

Sky-High Schemes

Well, for one thing, the list has changed very little — some new concepts have been and gone — tantalising names that never seem to have any concrete foundation — but the main players are still there. Among those that appear to have real potential we now have a launch calendar headed by a new data-only 'Little LEO' project called Orbcomm. This could be the first of the bunch to have real electronics in orbit. At the other end of the scale, there's Teledesic, the new scheme from Microsoft's Bill Gates and McCaw Cellular's Craig McCaw that's just been announced and seems to be rather ephemeral, and there's Inmarsat-P, which appears
than product.

Teledesic has taken over where Iridium left off
sationalism. I suspect the promoters think that with
the thrust of media speculation might be enough t
orbit without those costly rockets. When you pu
Gates behind a proposal based on 840 orbiting s
ing due to fly for seven years, you automatic

Different Flavours, Same Pie in the Sky

	CELSTAR	ELLIPSO	GLOBALSTAR	IRIDIUM	ODYSS
CONSTELLATION					
No. of Satellites	2	16 to 18	48	66	12
Orbit/Inclination	Equatorial	Elliptical 116	Circ/52°	Circ/86.4°	Circ/55°
No. of Planes	1 (Clarke orbit)	2 elliptical and 8 equatorial	8	6	3
Altitude	38,000km	520 to 7,800km	1,401km	785km	10,354
FREQUENCY					
Mobile User: **Uplink** **Downlink**	1.97-1.99GHz 2.16-2.18GHz	1.610-1.626GHz 2.483-2.5GHz	1.610-1.6265GHz 2.4835-2.500GHz	1.616-1.6265GHz 1.616-1.6265GHz	1.610-1,6265GHz 2.4835-2.500GHz
Gateway: **Uplink** **Downlink**	N/A N/A	N/A N/A	C-band C-band	27.5-30.0GHz 18.8-20.2GHz	29.5-30.0GHz 19.7-20.2GHz
CONNECTIVITY					
FDX Circuits	60,000 each	N/A	2,800	3,840	2,300
verage Satellite nect Time	24 hours	1-2 hours	10-12 minutes	9 minutes	2 hours
m Elevation	Depends on location	Variable	10°	8.2°	22°
URES					
	3-axis	3-axis	3-axis	3-axis	3-axis
	Bent pipe	Bent pipe	Bent pipe	Processing	Bent pipe
	15 years	5 years	7.5	5	15
	N/A	105kg	320kg	500kg	1,229kg
	About 100 fixed super-cell beams	19-beam	16-beam phased array	3 16-beam phased array antennas	Rigidly mounted 37 (up)/32 (down) beam ‘staring’ antenna
	No	No	No	4 crosslinks at 25Mbps; 22.55-23.55GHz	No
	DMA	CDMA	CDMA	TDMA/TDD	CDMA
	e VBR 8Kbps up to ps	Voice VBR 4.8Kbps; Data 0.3 to 9.6Kbps	1.2-9.6Kbps voice and data	Voice 4.8Kbps; data 2.4Kbps	Voice 4.8Kbps; data 1.2-9.6Kbps
	-1,000	$US1,000	$US750	$US2,00-$US3,000	$US300

a plastic moulded handset case and a decision to use intermediate circular orbits.

Most of the serious MSS proposals are now before the US Federal Communica- ons Commission (FCC) for frequency al- ation. Since these are global projects, 'd think they would need ITU certifica- but the ITU only ‘recommends.’ As a uence, each is seeking partnerships the US to facilitate regulatory ap- a country-by-country basis.

ollows, then is a run down of what y being proposed in rough chron- ogical order of when they are likely to fly.

Orbcomm

Orbcomm is a non-voice little-LEO proposal developed by Orbital Sciences based in Dulles, Virginia, and Canada's international carrier, Teleglobe. This is a multiple satellite system giving global coverage for short-messages, data-transfer and some position-location.

The organisation plans to launch two satellites this year (‘late 1994’ they say), and put up three more groups of eight over the next two years. So there will be 26 LEO satellites initially in the full constellation.

ORBCOMM	TELEDESIC
26 (later 36)	840
Circ/45° and 70°	Circ/polar
4 + 2 polar	21
785km	695-700km
148-149.9MHz 137-138MHz 400.5-400.15MHz	28.6-29.0GHz 18.8-19.2GHz
N/A N/A	30GHz band 30Ghz band
Packets only	Packets only
8 minutes	4 minutes
18 degrees	40 degrees
3-axis	N/A
Some processing	High processing
4 years	10 years
41kg	N/A
Single beam helix	24-beam phased array
4 at 56Kbps	8
DCAAS packet data	Packet data
Data only; Down at 4.8Kbps; Up at 2.4Kbps	Data only; 16Kbps to 2Mbps; Gigalinks to 1.2Gbps
$US100-400	N/A

These are small, simple satellites weighing only 89lbs (40kg) — about the size and weight of a small person — and the solar panels fold down to create a 1-metre wide, 0.2 metre high 'banjo-shaped' unit, so that eight can be stacked in the launch vehicle.

Orbcomm recently amended their FCC application, so there's a bit of confusion about some elements in the proposal. Eventually their constellation may expand to 36 LEO satellites if the usage justifies the increase. They'll begin commercial operations in early 1995, initially with four satellites servicing the US only, then they'll add another 24 in three launches, and later, another 10.

The final constellation will consist of four inclined planes at 45 degrees (inclination is always relative to the equatorial plane) with eight satellites in each. Two supplementary, 70-degree inclined planes with two satellites each will enhance the polar coverage. Orbcomm predicts a four year life for the satellites and plans to have all 36 in orbit by the end of 1997. All of the satellites have circular orbits at an altitude of 785km, so they are zipping around fairly fast (well under two hours), and at this height they get a bit of outer atmosphere drag.

Orbcomm plans to operate in the VHF band with 'narrowband' uplinks in the 148-149.9 MHz part of the spectrum and downlinks in both the 137-138 MHz and 400.5-400.15 MHz bands. Their spacecraft power system is designed to deliver an average of 70 watts of power from a three-metre-long 'shotgun' antenna.

They'll use a dynamic channel activity assignment system (DCAAS) which reduces interference in the 148-149.9 MHz band, and the company claims that the system has a total capacity of more then 60,000 messages per hour. They give no indication of usage costs.

The satellite-to-subscriber data-rate is 4.8Kbps, and the subscriber-to-satellite rate is 2.4Kbps. Data can be generated by a range of small fixed or portable devices including remote monitoring equipment.

Orbcomm communicators will be priced under $US400, they say. The first three available will be:

- A pocket-sized unit with an alphanumeric keyboard and LCD screen;
- A pager-sized unit made to be integrated with data collection and monitoring devices (for pipelines, ocean buoys, cargo-tracking and emergency units); and
- A PCMCIA Type II card for laptops, portables and PDAs (mainly e-mail).

They say that the 'typical' communicator will have a 5-watt output, weigh 340g and have a 50cm whip antenna. (That's going to be one hell of a PCMCIA card!)

The design of the whole spacecraft system is by Orbital Sciences in Dulles, Virginia, (a $US200 million p.a. company) and the project is funded by Canadian carrier Teleglobe. The plan isn't to bypass the national PTTs, so they will need to build a number of gateways in each region — the US will have at least four, for instance. They've also decided to use international standards like X.400 for e-mail addressing, which makes a lot of sense.

Obviously, when you look at this proposal, it has a pretty good chance of success; this is a low cost option. Orbcomm has followed the KISS principle: it has used simple repeaters; it has concentrated on e-mail and data; and it can introduce its satellite constellation progressively as demand builds.

Ellipso

Ellipsat (aka Mobile Communications Holdings Inc.) is obviously a company with confidence. Although its Ellipso proposal has had little attention from the American press, the company has a presence in Australia with an office in Sydney, and is one of six companies with long-term applications before the FCC. And, in my book, it is one of the most likely to succeed.

Ellipsat's partners are Westinghouse, InterDigital, Mantra, Harris, an Israeli defence company, and Barclays Bank. The satellites are being built by Fairchild, and Westinghouse will construct the ground stations.

This is a $US700 million proposal to deploy between 16 and 18 small (500kg) satellites in highly elliptical orbits — more satellites can always be added later. There are two distinct constellations: the Borealis constellation which has eight satellites in two inclined elliptical orbits with apogees (high-points) over the northern hemisphere, and the Concordia constellation with either six or eight satellites in just-elliptical orbits around the equator.

People living near the Arctic or Antarctic circles gain real value from inclined elliptical orbits, the use of which were pioneered by the Russians with their Molniya (12-hour) and Tundra (24-hour) orbits. Viewed from high latitudes, conventional equatorial orbiting satellites (like the Sun) are always near horizon level. So in Canada, Scandinavia, or Siberia, hand-held power just can't punch through the damp atmosphere or the foliage, and line of sight to the satellite is likely to be cut by buildings.

Ellipsat's northern hemisphere satellites (the Borealis constellation) will be roughly in Tundra orbits, but much closer to the surface of the Earth, and therefore not true pseudo-geostationary. The orbits are angled at 116 degrees, and they reach their apogee over America and Europe at 7,800km and perigee (low-point) at 520km. Each of the eight Borealis satellites will complete its orbit every three hours, and it will appear to be overhead for about one hour each time during its slow apogee loop. With three synchronised satellites, there will always be one overhead.

This arrangement serves three purposes; it puts the satellites high in the sky over the main population centres of the northern hemisphere (thus reducing tree and building obstruction), it slows the satellite down (in angular terms) at the time it is over the population it is intended to serve, and it requires less launch energy than is needed to establish a circular orbit, thus saving on satellite fuel.

The Borealis orbits will be Sun-synchronous, which means that they are mapped to the position of the Sun throughout the year. The idea is that they will always be in the best location at the best time over the

Earth during daylight hours, and over the less populated parts of the globe at night and during their non-function low-orbit sweep. So they'll need to shift each orbital plane slightly every time they make a correction.

Ellipso's Concordia constellation is arranged around the equator, and it uses a variety of nearer-circular orbits at distances from 4,000 km to 7,800 km. The population centres of the southern hemisphere are obviously further away from the poles and of secondary importance to Ellipsat, so they are to be serviced by almost equatorial orbits.

We would gain little advantage in the southern hemisphere from the elliptical orbits. The southern states of Australia aren't likely to be big satellite users, but Australia's north and Asian nations are. In Africa and South America, the likely users tend to be clustered around the equatorial belt.

What does Ellipsat believe is its unique selling feature? Mainly price. This comes from the simplicity of the satellites themselves and the relatively low number needed to cover most of the population-rich areas of the Earth. Their network is also designed to work with the local wireline carriers, rather than bypass them, so there shouldn't be too many regulatory problems.

The Ellipso satellites are small and lightweight 3-axis stabilised designs, and by using elliptical orbits the thruster fuel load can be reduced dramatically — but they do need a lot of radiation protection because they pass through the Van Allen belt. Because the satellites are active over the northern sweep and relatively inactive over the southern, they can also carry smaller batteries and use the perigee period for recharging. So at 500kg they can be launched six at a time, cutting costs dramatically.

The active electronics in these satellites consists only of 'bent-pipe' transponders (travelling wave tubes), one pair for each cell — for signals travelling in each direction. Your signal from a hand-held unit is just 'reflected' back to Earth by one transponder, and the return channel utilises the other: these are just wide-band repeater functions, and nothing could be simpler or more reliable in orbit. There's no switching at all in the satellites. The antenna on the satellite projects a 19-cell pattern of overlapping ovals on the Earth. These are designed carefully to compensate both for the curvature of the Earth and the angle of incidence to the satellite. The EIRP ('ground power') in all cells is therefore always roughly the same, and this is important with CDMA (Code Division Multiple Access) systems.

In CDMA, individual codes act like packet addresses attached to each byte transmitted, so a single transponder can handle multiple-cells, with many transmitters working to it simultaneously. There's no need to allocate narrow frequencies or time-slots — each spreads its signal over the full 16.5 MHz bandwidth of the transponder.

So CDMA provides a form of automatic statistical multiplexing just like ATM without needing synchronisation of access, or a dependency on collision detection (such as Aloha systems). And only the accumulated error-rates in decoding limits transponder capacity. Ellipso is using InterDigital's version of CDMA rather than Qualcomm's.

Each of the 19 cells (and each adjacent satellite) re-uses the same 16.5 MHz of bandwidth, and when a mobile is within range of two or more satellites or within the overlap of cells, the signals are cumulative (improve the quality) rather than create interference. Obviously Ellipsat intends to use a statistical technique similar to the RAKE receiver which sums multipath signals in terrestrial CDMA cellular.

This also means 'soft-handoff' is available between cells. As the satellites pass overhead, their 19 beams will sweep across the Earth and at regular periods there will be so-called 'softer-handoffs' between adjacent cells. The Ellipsat ground control station (GCS) in a region handles all switching functions and deals with each beam/transponder on a one-to-one basis.

Fading and shadowing effects are minimised because the portable will often be simultaneously communicating with two satellites within view once the full constellation is flying. Then, as one of the satellites moves out of range, the calls will make a true soft handoff (under ground control) to the next. At no time is the link broken.

Ellipso anticipates the system being used by fixed installations as well as mobiles and hand portables. Some of the mobile terminals for Ellipso will be capable of 5 watts of R/F power, and hand-helds will likely be kept down to 1 watt. However, these figures are for maximum power only; with CDMA the very fine power-control circuits keep output much lower than the maximum for most of the time. Anticipated service rates are about $US50 per month, with 50 cents a minute for the space segment and another 10 cents a minute for the tail connection to the local wireline service provider.

Globalstar

A few years ago Loral, one of the most innovative of the US defence contractors in the design and construction of military satellites, teamed up with Qualcomm (who have dominated the development of CDMA in cellular) to establish Loral Space Systems and create Globalstar. Loral is to build the space equipment, and Qualcomm the mobiles and earth stations. These will likely be dual-mode CDMA handsets which are switchable between terrestrial CDMA and satellite.

Globalstar is a LEO project which will consist (eventually) of 48 satellites in circular orbits at heights of 1,400km, with orbital planes at 52 degrees: it is to have voice, data-messaging and position-location capabilities. The funding comes through a limited partnership between Loral, Qualcomm, Alcatel, Alenia, DACOM, Deutsche Aerospace, Hyundai and Vodafone. (Vodafone involved in CDMA? Surely this is not the same Vodafone GSM that has a technology-restricting agreement with the Federal Government to block CDMA cellular phones from being used in Australia? Surely not!)

These partners have just coughed up the first $US275 million for Qualcomm and Loral Space Systems to go ahead with the development of the necessary satellites and ground technologies. They didn't bother applying for an FCC experimental licence, because they say space-experimentation isn't necessary.

Globalstar, Ellipso and Odyssey all use CDMA technology and their frequency plans call for the same uplink (1.610 to 1.6265 GHz) and downlink (2.4835 to 2.5 GHz). And since CDMA doesn't require frequency assignment, there's no reason why they can't share the spectrum space — or so people tell me — but so far they are all fighting to have an exclusive allocation.

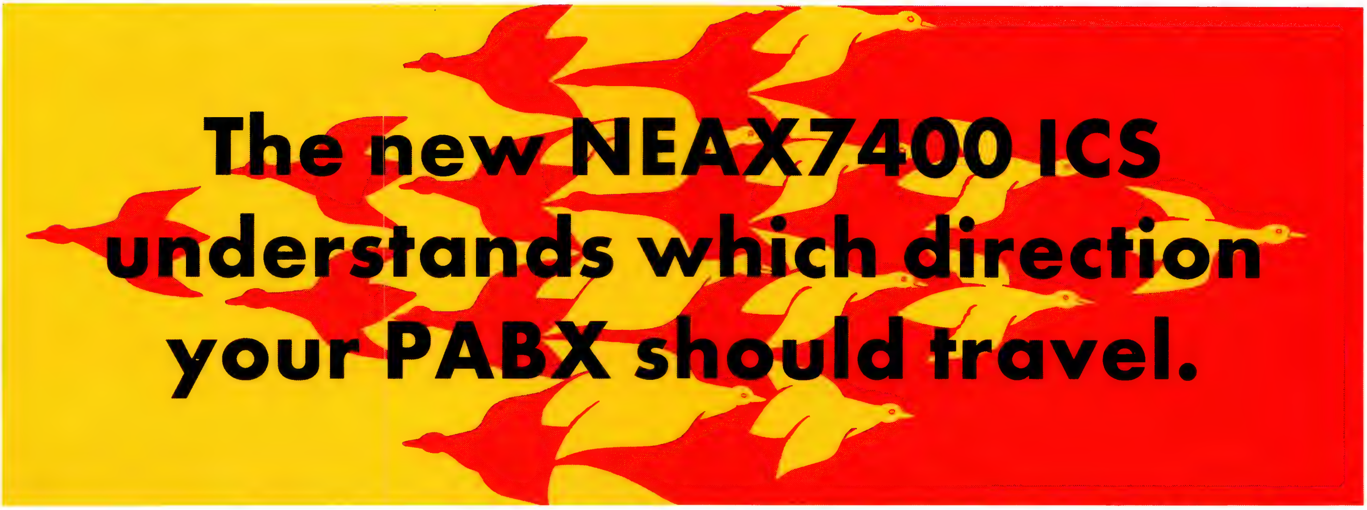
The development of the Globalstar satellites will take about four years, and the whole project is estimated to cost $US1.8 billion by the time all the birds are flying sometime in 1998, with full commercial service in 1999. Design of the dual-mode terrestrial-cellular/Globalstar handset is well advanced, and on current estimates they'll cost about $US750. Calls will be 30 cents a minute for the space segment, plus 10 cents for tail costs, and they plan to add a $US10 monthly service charge.

Celstar

Celsat Inc. was the first company to file with the FCC for nationwide spectrum to run a satellite cellular service. They want 40 MHz of bandwidth in the Emerging Technologies bands (1.97-1.99 GHz and 2.16-2.18 GHz) for two $US220 million geostationary satellites to sit over the American equator. This is not a global LEO or MEO system as the others propose, but a geostationary system. It deserves a quick mention because it may represent an cheap alternative in the very near future.

The Celsat proposal ('Hybrid Personal Communications System') is to utilise the same spectrum for both the space and the ground PCS/cellular digital technology — 'to leapfrog all existing and planned mobile communications systems.' In other words, they expect to provide a cellular system which has normal R/F links to terrestrial base stations, but when load comes on or you move out of range, the link switches to a 'supercell' overlay — very large cells projected down from the satellite. CDMA can handle this.

Since there's no set channelisation, the satellites can provide bandwidth-on-de-



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mand up to a limit of 144Kbps for low-rate videoconferencing. Each satellite is said to be capable of handling 55,000 simultaneous voice-call circuits — and the two together can handle 88,000 (because of overlap interference). The beams from each satellite create roughly 50 supercells on the Earth, and about 100 supercells will cover the whole of the US.

While Celsat can provide 88,000 space voice-circuits, Iridium can only claim 4,400, they say. I can't work their maths out, but they come to the conclusion that the Celsat space segment can provide voice services for a capital outlay of $US640 per circuit, whereas Iridium needs $US12,000. The terrestrial system they propose in parallel will handle one million simultaneous calls at a very low price also.

In an April 1994 release Celsat said: 'our extremely low satellite cost, less than a penny a minute per phone call, will permit drastic reductions in cellular prices.' (That's one cent per minute, folks! Space or terrestrial cellular!) The overall system concept, they claim, 'is larger and more robust than any single radio-based personal communications system or service heretofore proposed . . . potentially as many new channels as the entire existing MCI network, but these will be wireless channels,' they say.

Service offerings will include compressed video, paging, high-speed fax and high-speed data, with total privacy, precise position-determination and improved quality voice. Celsat's portable phone was claimed to have the lowest radiating power at 0.1 watt (this was before Teledesic made its 0.01W claim!).

Celsat's idea is the first to propose a hybrid (i.e. space/ground) service; the first to propose dual use of the same spectrum bands for both space and ground, and the first to propose coexistence with incumbent users of the frequency bands. And, if they really can put space and terrestrial services into one handset in a total integrated 'single-mode' way, and if they can provide calls at one-cent-a-minute, then they won't need much of a marketing budget to flog the technology to the masses.

Odyssey

Odyssey, proposed by TRW, is the only one of the main contenders to propose medium earth orbits. These are circular orbits at a distance of 10,354km — which places the satellites above the Van Allen electron belt. Odyssey will have a constellation of 12 satellites in three planes inclined at 55 degrees to the equator, so they provide a good coverage to the tropical and temperate zones of the Earth, but service will be thin at the poles.

The extra altitude enables TRW to get high population coverage with few satellites (they can actually operate quite well with only the first six). When they have the full constellation in space, you'll generally have your choice between two and three satellites at any one time. With LEOs, they'd need about 60 satellites to get this level of coverage.

The services available include voice, positioning, paging, messaging, and data transfer. TRW says that there will be hand-helds, transportables, and vehicular models available, with hand-held phone prices of between $US250 and $350, and a call charge of about 65 cents a minute, plus a 10 cent tail charge, they say. A monthly service fee of $US24 will also be imposed.

Probably the most unusual feature in the Odyssey proposal is the steerable antenna. Actually, it is the antenna which steers the body, but the result is the same. Since two-thirds of the globe is covered in water, TRW intends to maximise its use of the satellites by keeping the most of the 32 beams of each antenna turned towards the populated areas of continents whenever possible. This also provides them with the flexibility to match demand with the circuits available; three-quarters of the 2,300 available can be directed towards only 10% of the area currently being covered by the satellite. In all the competitive LEO proposals, beams sweep blindly over the landscape.

Unlike Globalstar, which spreads the spectrum across the entire 16.5 MHz, Odyssey divides this bandwidth into three wide-band channels of 4.83 MHz each. Each satellite uses simple 'bent-pipe' transponders on each of these three channels, and multi-beam antennas then subdivide the coverage region into sets of contiguous cells.

The hand-helds will be dual-mode (terrestrial cellular and satellite). They are said to have an output of 0.5 watt and use a quadrifilar helix antenna (whatever that is!). The uplink will be in the SHF (Super High Frequency) L-Band and the downlink on the S-Band, and both up and down links are individually power controlled.

At only one-third the distance from Earth as a geostationary satellite, Odyssey can get away with (roughly) one-ninth the R/F power (a 11dB difference) in both the satellite and the handsets. Power control is variable; up to 25% of the satellite's power can be shunted into a single beam if necessary — all under earth station control.

There will be ten or eleven earth stations worldwide, and they will each use four widely separated 5-metre dishes. The design requires distances of at least 30km between each dish, with each being responsible for one satellite within the station's view. This geographical separation also solves a diversity problem if there is monsoonal rain over one dish.

TRW seem largely to be backing this project themselves, but a joint-venture between Mantra and Marconi is involved in some way. TRW build satellites commercially, and this design is a modification of one they already build for the US Navy — so with the end of the Cold War, they probably have free time on their assembly line. This could well be the first of the major proposals to reach orbit; there's nothing really experimental about the proposal.

Their satellites are few in number and they're probably half-built already, so you can believe Odyssey when they say that their system could be commercial by January 1998. And since the satellites have beam steering, are high in capacity, and are designed to last 15 years (most LEOs fall out of the sky in five) — it could well be that this proposal has a real cost advantage. Time will tell.

Iridium

Someone truncated Iridium a year or so ago; they dropped the number of satellites in the constellation from 77 to 66 as a cost-cutting measure. And since the name Iridium came from the chemical element which had 77 electrons in the orbit, I guess we should now call it Dysprosium which has 66. Certainly it has been giving dyspepsia to many of the world's major wireline carriers — and, I would suspect, to the Motorola management.

Until Bill Gates came along boasting 840 satellites, Iridium was most ambitious of the proposals, and technically the most complex. The Iridium proposal has now changed from having a 37-channel capacity on each of 77 satellites to providing 48 channels on 66 satellites. The satellites will still move in 11 circular planes over the poles at a height of 800km.

It is difficult to discover the progress of Iridium. Motorola applied for, and received, an experimental licence from the FCC a year or so ago, and it plans to launch five experimental satellites in the next two years. But note, these are 'experimental' — the current betting is that commercial operations will only begin by about the year 2000 — and by then, it could be much too late.

Major changes have been made to the original proposal. One of the most significant was to drop the emphasis on space-switching the signals. The original idea was to by-pass local PTTs by providing switching over satellite-to-satellite links in the space segment. Your signal could be uplifted at Alice Springs, pass between a half-dozen satellites, and reach a friend hiking in the hills of Patagonia — all without a wireline provider becoming involved.

For some reason this idea didn't find favour with the PTTs! If they'd continued with this idea, Motorola could have been forced by international law to switch off the satellites every time they passed over territory where bypass was forbidden. And that is most of the world since, in most

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countries, telecommunications is now a form of hidden government taxation.

Iridium will now drop the signals back to Earth at the nearest PTT-owned gateway, and calls will be transferred from there — via wire or fibre. This change has made most of the original work on a special billing system redundant, also, since the PTTs will now do this work.

There's also bit of confusion about the frequencies that Motorola want to use for Iridium. It is reported as proposing to use the same frequencies for up and down links, and yet being willing to restrict bandwidth in the 1.6 GHz range from the standard of 16.5 MHz to only 10.5 MHz. This appears to be remarkably generous — but there's a story behind it.

A year or so ago, the Iridium team introduced its 'dynamic capacity allocation scheme' to allow concentration of channels over densely populated regions. They also modified the antenna beam pattern (now three phased arrays with 16 spot beams, each) to reduce potential interference problems, but they decided that they still needed to boost the satellite's transmission power.

Motorola had already run into problems with downlink signal strength because they are using pulsed time-division (TDMA) not CDMA. Under the current international rules there's a limit to power on the downlink (at 2.5 GHz), but not on the uplink (at 1.6 GHz), since a powerful uplink beam is only likely to interfere with Martians.

To cut a long story short, Motorola appealed to the FCC for special consideration in the rule-making proceedings. They wanted to step around this ITU-imposed limitation by using a loophole which permits the designated uplink frequency band to be used also for downlink services 'in special circumstances.' The idea was to use Time Division Duplex (TDD) with slots assigned for both up and down in the same frequency band — a technique which creates interesting problems in timing. The company argued that it needed to breach these power limits to combat fading and shadowing problems; but on last reports it seemed the FCC wasn't buying it.

With Iridium's TDMA system, they've got to coordinate the frequency/slot allocation between the satellite's 48 antenna cells, and also with neighbouring satellites. Timing is not as critical as with GSM; Iridium has a 90ms TDMA frame, divided into four users (8 slots — up and down), and this gives each a 2.4Kbps data-rate or 4.8Kbps for voice. Capacity is said to be 80 users in each cell — or 3,840 per satellite, but you have got to reduce this number because of overlap and coordination problems with neighbours. However, another paper puts the per-satellite capacity at over 4,000.

In preparing this article, Motorola were the most uncooperative of the companies, and when these stories emerge (mostly from reliable sources) it is probably not difficult to understand why. Despite several earnest promises, I received nothing new about the technical changes from the company — so I'm relying here on some private correspondence with a couple of very well-placed US informants.

Iridium now has its sights set on a commercial service by 1999. Its international consortium is in place, and the group contracted back with Motorola (to the tune of $US3.37 billion) to design, build and operate the whole box and dice. The investment figures I have from 1992 show that the overall project was originally estimated at $US3.5 billion, of which Motorola would invest $US150 million or 4.3% — which always created suspicions that such a wealthy company wasn't really a true believer in its own project.

The 1992 estimate of handset costs (about $US4,000) has been wound back sharply to somewhere between $US2,000 and $US3,000, and they have, 'already in the works, a Microlite-type handset providing 0.5W of power.' I'm not an expert here, but I'd bet this is much too low for a TDMA system, and the cost is far too high when compared to Odyssey's $US500.

Monthly service fees were estimated in 1992 at $US50, with a five minute call said to cost about $US21. I don't have later estimates — but if Motorola hasn't radically rethought its tariffing policies in the last two years, Iridium is in big trouble.

Inmarsat-P

Inmarsat currently says that Inmarsat-P will be a $US2.4 billion system using an ICO-based (Intermediate Circular Orbit), 12- to 15-satellite constellation. The system is designed to provide hand-held telephones, fax and data on a global basis. It will be in place by 1999 or 2000. Inmarsat recently decided to float an affiliate company (with $US10 million in working capital) to handle the new mobile satellite developments. Seventy percent will be owned by Inmarsat and its investor signatories (the carriers), and the balance by private investors. Equity issue for between $US500 million and $US1 billion of stock will occur in September or October, and Telstra is planning to take a large slice.

Project 21 has been on the cards for a few years. However, after a bit of infighting they've changed the name to Inmarsat-P and are suddenly striking a note of urgency in defining the technology in order to bid for a slice of the 2 GHz frequency spectrum and some bands below 16 GHz, needed for feeder links.

Inmarsat is currently the world's only operator of a global satellite system for mobile and remote communications. With five operational spacecraft in geostationary orbit, it provides telephone, facsimile, telex and data services to almost 40,000 users at sea, in the air and on land.

Inmarsat-M terminals are the smallest available today. They are briefcase sized, cost in the region of $15-20,000, and will support 2.4Kbps data or digitised voice. The call cost is about $4-6 a minute, but the equipment is inevitably the most expensive component. There's also Inmarsat-A or -B, with terminals about the size and weight of a hefty suitcase — but they are usually installed in ships or on oil platforms. These will have 60cm or larger dish antennae and support data rates up to 9.6Kbps on A, and 64Kbps on B. Call costs begin at $6 a minute.

It's always hard to know what to believe when you read Inmarsat documents: they are always flooded with motherhood statements and generalities. You'd expect to be getting technical details by now instead of these vague statements. For instance, their P-handset will be based on a 'low bit-rate, high-quality digital voice encoder.' Gee! Then they tell us that the handsets will have 'manual or automatic selection of satellite services, if cellular is unavailable.' I guess that rules out mental telepathy-switching as the only other viable choice.

They do, however, get specific sometimes — for instance, they promise fax, and fax is notoriously difficult in association with low bit-rate vocoder/synthesis techniques. They also say that the handset will include an integral pager for standby call-alerting (saving battery power) and which will receive short text messages, 'even inside buildings.'

Position determination is an essential part of Inmarsat-P — as it is now with every system. But Inmarsat's mobile units will automatically report location at regular intervals, a feature which was primarily designed for call-routing. However it is also an important safety/security feature, and it will prove invaluable to truck fleets and courier companies.

Each terminal will also have its own phone number which will operate anywhere in the world — and this is where Inmarsat can sneak some advantage over the other LEO players. They've already been included in the ITU's numbering plan for their maritime services; they have a special global numbering scheme because ships at sea lack any carrier-identifiable geographical location.

But all isn't rosy in the Inmarsat garden; the organisation is having problems with many of its signatories. Current rules lock them into investing in Inmarsat-P whether they like it or not. Obviously many of them are not happy — hence the move to float Inmarsat-P as a separate company.

I guess this internal squabbling is why Inmarsat constantly appears to be having problems getting its act together — and why its public-relations department ap-

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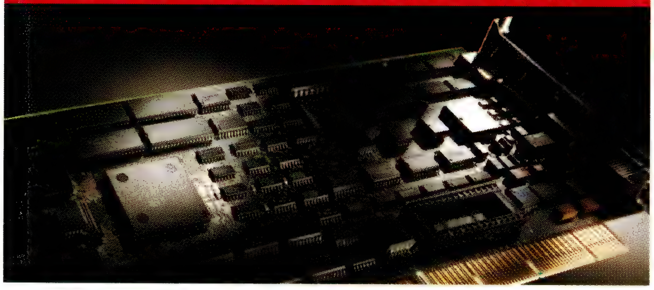

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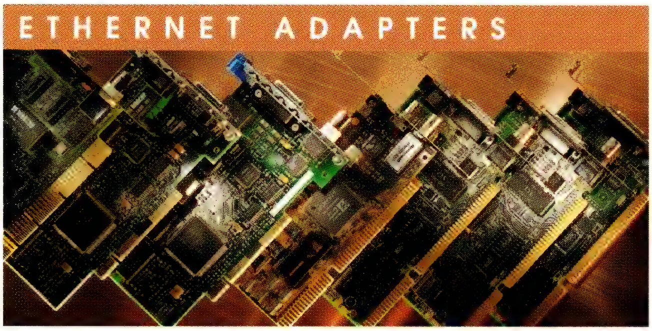

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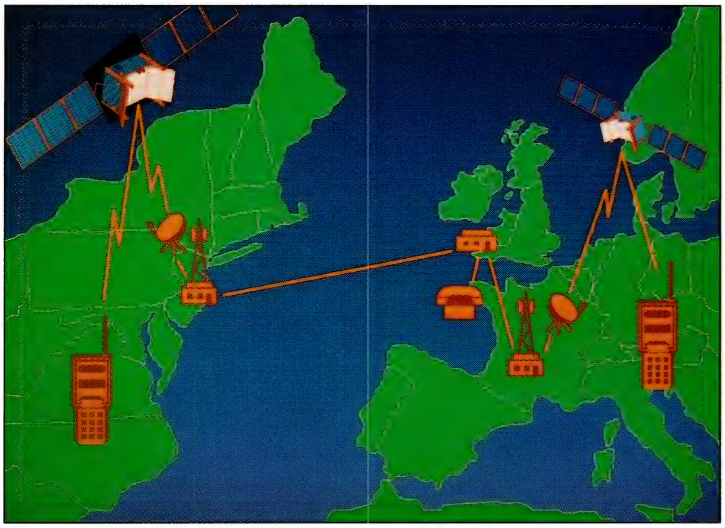


Loral Corporation's proposed Globalstar system will route a subscriber's wireless phone call up through one of 48 low earth orbiting satellites, down through a gateway connected to the PSTN, and on to the calling party or the party called. Calls destined for another Globalstar phone will continue through a second gateway, up to a satellite and back down to the receiver. Loral and its partners say Globalstar will begin operating in 1998.

pears to be more dynamic and inventive than their R&D. In October, for instance, a big deal was made about Ericsson presenting CEO Olof Lundberg with the first model of the Inmarsat-P handset — *seven months before* they decided whether they'd use a GEO system or a CIO (intermediate orbit) one. You'd have to be more than gullible — certifiably stupid, in fact — to believe that such a 'model' was anything more than a moulded plastic casing.

Teledesic

The announcement of Teledesic probably would have attracted little attention if it weren't for the involvement of Microsoft's Bill Gates and McCaw Cellular's Craig McCaw, two of America's wealthiest techno-tycoons.

They made it even more sensational by going well over the top with a plan involving 840 LEO satellites and costed at 'approximately $US10 billion.' What we didn't hear until later was that the up-front capital input by the big names was only $US10 million (0.1%) and the rest would be raised from investors. With 840 satellites, many people will figure Teledesic must be 13 times better than Iridium (66 satellites) so I doubt that Bill will have problems finding the money.

The Teledesic system differs from the other proposals (except for Orbcomm) in that it is concentrating on short messaging and data transfer rather than voice. It is also designed for fixed rather than mobile telephony: in other words, they aim to replace your desktop PC/modem connection with a satellite loop. They say that your PC will have between 16Kbps and 2Mbps of radio bandwidth, and they also plan to provide a 'GigaLink' system for broadband users. This will require a large phased-array antenna and it will provide data rates from 155-Mbps to 1.2Gbps.

The American FCC has known about this one for a number of years. It was originally floated by Calling Communications Corp. and the FCC has already been asked for the allocation of frequencies.

As you'd expect, the technical details are vague and constantly changing. They have not specified yet which access technique they intend to use (they say 'high speed packet-switched'), so obviously they see this as a satellite extension of ATM/B-ISDN. But note that they don't ever actually specify ATM in their information handouts — this rumour came from an article in *The Economist.*

The section of the spectrum requested is in the Ka band, between 20 GHz and 30 GHz (the high end of SHF). This is all relatively virgin territory, and with the spacial diversity provided by 840 satellites there's going to be stacks of bandwidth available; enough for '20 million typical wireline business users' simultaneously, they say. They anticipate the satellites being used for teleconferencing, remote medicine, and other applications needing large volumes of data, but the system can only permit a small number of GigaLink subscribers in any one region.

In this SHF band, satellite transmissions are subject to rain absorption, and Teledesic needs its working satellites to always be high in the sky to avoid the blanketing effect of buildings, trees and mountains. Teledesic says that the satellite must be 40 degrees above horizon to be effective — which is why they need so many.

The Teledesic constellation provides 21 different orbital planes spaced every 9.5 degrees around the equator. There are 40 satellites to each plane (plus four as spares) at a height of 700km, and they'll each fly over the poles providing total global coverage. This also means that two-thirds of the time the satellites are over water, and for a large part of each orbit they'll also be over ice.

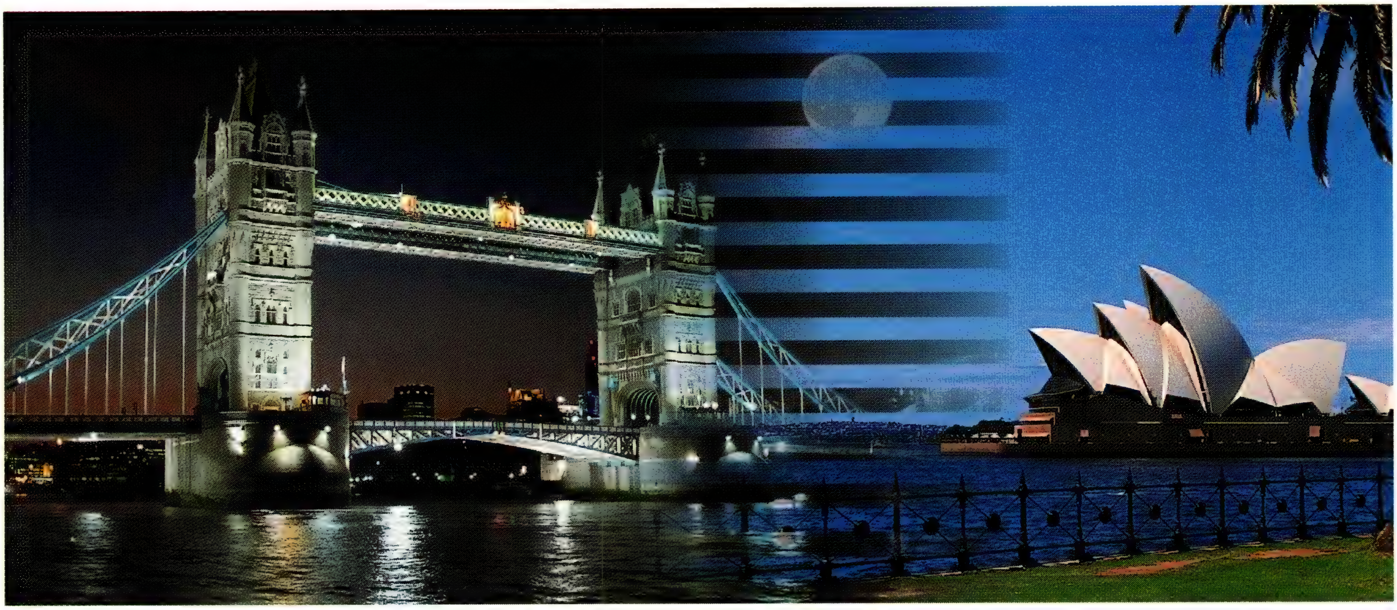
Although the Teledesic satellites can talk to the eight nearest to them (two each, front, back and on either side), I doubt that Gates intends to by-pass the wireline telephone companies — even though it may be full global open competition by the time Teledesic flies.

The satellite design is based on packet-switching and the satellites will process and route the data, and by relaying packets between orbital planes, they can also reduce the number of gateways needed. The cross-linking also provides a degree of network redundancy. They talk about the satellite's packet-switch being equipped with a 'distributed adaptive routing algorithm' which learns the current status of the network to select the path of least delay. Between-the-lines this reveals (I think!) the key reason why voice has been omitted — they expect high latency — it's a millisecond store-and-forward system.

The user-terminals can 'employ antennas as small as 16cms in diameter, and as large as 1.8 metres,' they say — and in phased-arrays that's the difference between a bathroom tile and a garden-shed roof. Transmit power varies from 0.01 watts (sic) to 4.7 watts. They say that a 2Mbps rate is possible with 0.3 watts 'with a suitable choice of antenna size.' Well! Obviously!

Don't think about Teledesic as ever being used for mobile systems — except, perhaps, mounted on large trucks, trains, or ships. In a high wind, a hand-held mobile with a 1.8 metre flat panel array would certainly be an interesting sight to behold.

Stewart Fist is a freelance journalist based in Lindfield, NSW.



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TECHNOLOGY

PPP Delivers on Interoperability Promises

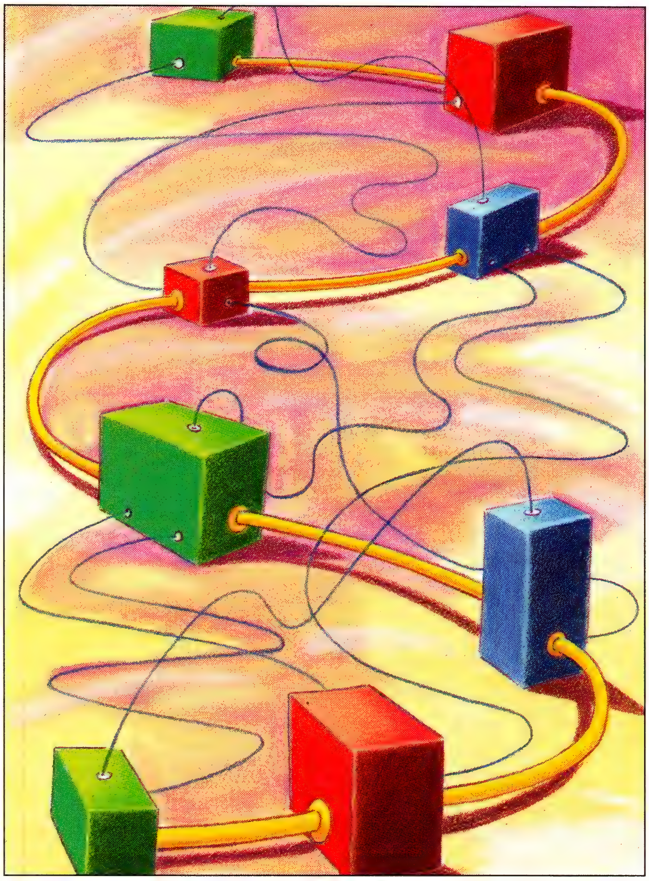
A midterm test of routers claiming point-to-point-protocol compliance shows vendors really are getting closer to offering any-to-any protocol connectivity over the wide area.

The encapsulation techniques that bridge and router vendors use to send traffic over wide area links represent one of the last bastions of proprietary technology in the internetworking world. As such, they are also one of the last obstacles to equipment interoperability. It doesn't matter how many LAN protocols two given devices have in common; if they don't use the same WAN protocol, they simply won't be able to communicate.

PPP, the point-to-point protocol, is aimed squarely at eliminating this problem. By defining a standard way to send high-level LAN protocols like IP, IPX, and DECnet across the WAN, PPP enables routers or bridges to communicate over wide area links, regardless of make or model. At least, that's the theory.

That theory hasn't been verified by actual interoperability tests — until now. A group of internetworking equipment vendors recently commissioned Winterfold Datacomm to put PPP-compliant routers through a battery of tests to determine just how effective the protocol is in providing interoperability. We tested routers from eight major suppliers — Advanced Computer Communications (ACC), Cisco Systems, Digital Equipment Corporation, Eicon Technology, Newport Systems Solutions, Novell, 3Com and Wellfleet Communications. Each vendor's router was tested with the routers of every other vendor to determine its ability to exchange packets using six different LAN protocols: IP, NetWare IPX, AppleTalk, DECnet, OSI's CLNP (connectionless network protocol), and transparent bridging.

The results of these tests yield the first hard evidence regarding interoperability via PPP. Our overall impression: PPP delivers the goods. TCP/IP interoperability is almost universal, and although tests of other protocols revealed an assortment of snags, those stem mainly from implementation differences rather than inherent flaws in PPP. Router makers are now working out these kinks, and by year's end interoperability for IPX, DECnet, OSI, and transparent bridging should be widespread. Vendors still have a lot of work to do on their AppleTalk implementations, however.

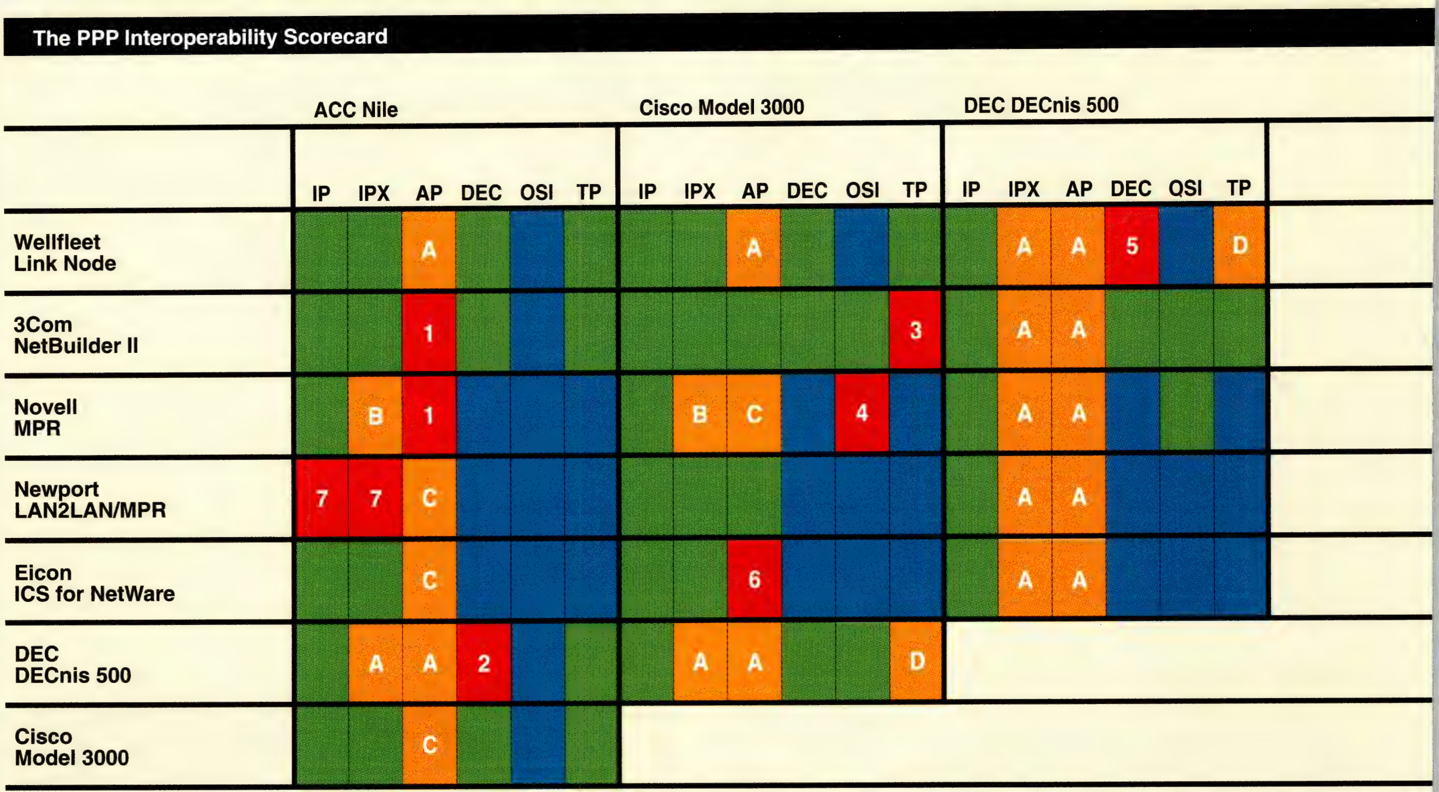


The Importance of PPP

Although internetworking vendors deserve credit for deploying PPP in their products so quickly, there's little doubt that market forces are driving those implementations. Most growth in the bridge/router market now is at the low end, as more organisations look to link smaller branch offices into their enterprise networks. The low-speed access router market has attracted entries from a number of vendors that don't offer high-performance products. The resulting market fragmentation makes single-vendor implementations less likely.

As these market factors began to come together, PPP emerged as the most logical tool for equipment interoperability. The Internet Engineering Task Force (IETF) began circulating PPP request for comment (RFC) documents in late 1989. Demand for widespread interoperability propelled PPP from its original confines in the TCP/IP world to the wider world of LAN internetworking.

The PPP Interoperability Scorecard



	ACC Nile						Cisco Model 3000						DEC DECnis 500					
	IP	IPX	AP	DEC	OSI	TP	IP	IPX	AP	DEC	OSI	TP	IP	IPX	AP	DEC	OSI	TP
Wellfleet Link Node	🟩	🟩	🟧 A	🟩	🟦	🟩	🟩	🟩	🟧 A	🟩	🟦	🟩	🟩	🟧 A	🟧 A	🟥 5	🟦	🟧 D
3Com NetBuilder II	🟩	🟩	🟥 1	🟩	🟦	🟩	🟩	🟩	🟩	🟩	🟩	🟥 3	🟩	🟧 A	🟧 A	🟩	🟩	🟩
Novell MPR	🟩	🟧 B	🟥 1	🟦	🟦	🟦	🟩	🟧 B	🟧 C	🟦	🟥 4	🟦	🟩	🟧 A	🟧 A	🟦	🟩	🟦
Newport LAN2LAN/MPR	🟥 7	🟥 7	🟧 C	🟦	🟦	🟦	🟩	🟩	🟩	🟦	🟦	🟦	🟩	🟧 A	🟧 A	🟦	🟦	🟦
Eicon ICS for NetWare	🟩	🟩	🟧 C	🟦	🟦	🟦	🟩	🟩	🟥 6	🟦	🟦	🟦	🟩	🟧 A	🟧 A	🟦	🟦	🟦
DEC DECnis 500	🟩	🟧 A	🟧 A	🟥 2	🟦	🟩	🟩	🟧 A	🟧 A	🟩	🟩	🟧 D						
Cisco Model 3000	🟩	🟩	🟧 C	🟩	🟦	🟩												

LCP = Link Control Protocol
MTU = Maximum Transfer Unit (maximum packet size)
NCP = Network Control Protocol
IP = Internet Protocol
IPX = NetWare Internet Packet Exchange
AP = AppleTalk
DC = DECnet Phase IV
OSI = OSI Connectionless Network Protocol (CLNP)
TP = Transparent Bridging

PPP's main purpose is to provide a standard mechanism for encapsulating higher-level LAN protocols for transmission over a wide area network. This encapsulation is done at the data link level, the second layer of the OSI protocol stack. Although most vendors use the HDLC (high-level data link control) protocol or some variant as their WAN protocol, HDLC offers no standard way to encapsulate different high-level protocols in the HDLC frame. Because of this, every vendor has its own way of handling encapsulation in HDLC.

PPP is based on the HDLC packet structure, but it extends that structure by tacking on a 16-bit protocol identifier that tells the receiving system exactly what the packet contains.

A PPP packet can contain one of three kinds of information: the link control protocol (LCP); control frames for a higher-level protocol; or actual data. LCP is used by a transmitting router or bridge to check that the receiving device supports PPP. LCP negotiates parameters for the session, such as maximum packet size or authentication. Once a session is established, devices use LCP to let each other know if they don't support a requested higher-level protocol.

Control frames are used to set up the link for a specific higher-level protocol. Before a transmitting router starts to send packets for a particular protocol, such as IPX, it must establish that the receiving device supports that protocol. It also must negotiate any parameters involved in starting the link. Each high-level protocol has an associated 'control protocol' to handle these tasks, as well as to shut down the link once transmission is completed. Once the link has been established an all necessary parameters set, actual user data can start to flow.

As noted, PPP actually is a collection of specifications, rather than a single standard. The RFC that can be considered PPP's core specification, RFC 1331, describes the LCP, as well as how link parameters are negotiated and how higher-level protocols contained in a PPP packet can be identified.

Beyond this core, each higher-level protocol is described by its own RFC spec. For instance, there are separate RFCs for IP, IPX, DECnet, and AppleTalk. Router vendors can implement as many (or as few) of these protocol-specific RFCs as they want. At first, most vendors focused on compliance with the TCP/IP spec; the trend now is to implement RFCs for every protocol their routers support.

Potential Snags

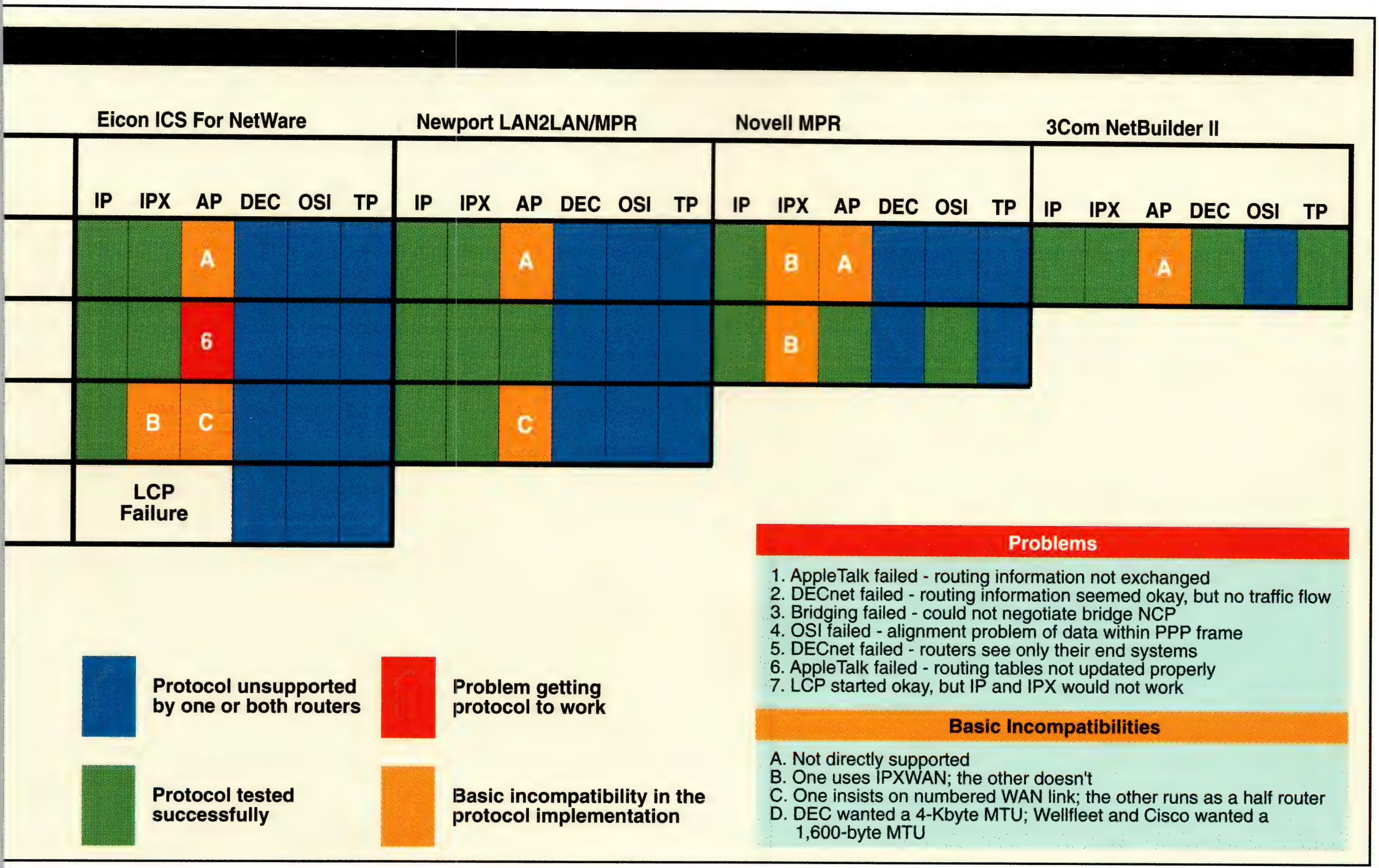
Obviously, routers from different vendors can communicate via PPP only if they both implement the RFC spec for the high-level protocol involved in the transmission. But PPP is prone to other interoperability snags that can arise because parts of the standard are open to different interpretations.

Some of this disparity is due to the fact that PPP is a developing standard. In some cases, vendors jumped the gun and deployed PPP specs before they were formally approved; slight differences between those early implementations and the final specs can create interoperability problems, as our tests revealed.

Another perceived interoperability obstacle for PPP has to do with the limitations of routing industry standards in general. Many vendors offer extra features that can be implemented between their own routers, including data compression, SDLC tunnelling, and spoofing of polls and broadcasts. When routers from different vendors are linked, these features disappear because they are proprietary.

As industry standards for advanced routing features develop, PPP can be updated to accommodate them. For instance, router vendors are close to agreeing on an SDLC tunneling standard called Data Link Switching (DLSw); once that happens, an RFC covering DLSw can be added to the PPP collection. Several vendors involved in our tests say they plan to propose their data compression technologies as a PPP standard.

Although PPP clearly is not a final standard, the need for interoperability testing at this juncture is critical simply because vendors are using the PPP label to claim widespread interoperability. We approached this test as a sort of midterm report card to determine whether PPP is now a usable standard for corporate networks or simply a very handy marketing tool.



Eicon ICS For NetWare						Newport LAN2LAN/MPR						Novell MPR						3Com NetBuilder II					
IP	IPX	AP	DEC	OSI	TP	IP	IPX	AP	DEC	OSI	TP	IP	IPX	AP	DEC	OSI	TP	IP	IPX	AP	DEC	OSI	TP
🟩	🟩	🟧 A	🟦	🟦	🟦	🟩	🟩	🟧 A	🟦	🟦	🟦	🟩	🟧 B	🟧 A	🟦	🟦	🟦	🟩	🟩	🟧 A	🟩	🟦	🟩
🟩	🟩	🟥 6	🟦	🟦	🟦	🟩	🟩	🟩	🟦	🟦	🟦	🟩	🟧 B	🟩	🟦	🟩	🟦						
🟩	🟧 B	🟧 C	🟦	🟦	🟦	🟩	🟩	🟧 C	🟦	🟦	🟦												
LCP Failure			🟦	🟦	🟦																		

🟦 Protocol unsupported by one or both routers

🟥 Problem getting protocol to work

🟩 Protocol tested successfully

🟧 Basic incompatibility in the protocol implementation

Problems

1. AppleTalk failed - routing information not exchanged
2. DECnet failed - routing information seemed okay, but no traffic flow
3. Bridging failed - could not negotiate bridge NCP
4. OSI failed - alignment problem of data within PPP frame
5. DECnet failed - routers see only their end systems
6. AppleTalk failed - routing tables not updated properly
7. LCP started okay, but IP and IPX would not work

Basic Incompatibilities

A. Not directly supported
B. One uses IPXWAN; the other doesn't
C. One insists on numbered WAN link; the other runs as a half router
D. DEC wanted a 4-Kbyte MTU; Wellfleet and Cisco wanted a 1,600-byte MTU

Although interoperability testing was our primary goal, we also wanted to include different router types in our test mix. Because branch-office routing has become so popular, we decided to include smaller access routers as well as the higher-end devices typically used in central sites. We tested five standalone routers (ACC's Nile, Cisco's Model 3000, DEC's DECnis 500, 3Com's NetBuilder II, and Wellfleet's Link Node) and three PC-based routers (Eicon's Interconnect Server [ICS] for NetWare, Newport's LAN2LAN/MPR, and Novell's Multiprotocol Router [MPR]).

Along with a mix of router types, we wanted to include a range of high-level protocols. We came up with six protocols that we feel represent the bulk of LAN internetworking traffic on corporate networks; TCP/IP, IPX, AppleTalk, DECnet Phase IV, OSI CLNP, and transparent bridging of Ethernets and Token Rings. We then went about setting up the test bed and test methodologies (see 'The PPP Interoperability Test Bed' on page 84).

The PPP Connection

Testing each router's ability to interoperate with the other seven routers requires a theoretical maximum of 168 separate tests (see the table). However, some of the routers we tested do not handle all six benchmark protocols; the Eicon ICS and Newport LAN2LAN/MPR, for instance, do not route DECnet or CLNP, nor do they offer transparent bridging. Eliminating interoperability tests for unsupported protocols brought the total down to 110 separate tests. And some routers handled certain protocols but did not include PPP implementations for those protocols; this eliminated another 20 interoperability tests.

Of the remaining 90 tests, we completed 64 successfully, for an interoperability success rate of about 71% (see 'PPP Router Report Card' on page 86). By far, the vendors turned in their best PPP interoperability results for TCP/IP. Of the 28 TCP/IP tests performed, only two did not succeed (both those tests involved the Newport router).

The 26 unsuccessful tests fell into two broad problem categories; basic incompatibilities in the protocol implementations of the two routers involved, and failures between routers that had no apparent implementation differences.

In some cases, the basic incompatibilities can be traced to the fact that some router makers jumped the gun on their PPP implementations. For instance, the RFC for NetWare IPX — known as IPXWAN — was only recently defined by Novell. Before that, however, other router makers developed their own PPP implementations for the Novell protocol. Because of this, only one vendor — Newport — was able to demonstrate interoperability with Novell's MPR when it came to transporting IPX across the WAN. Because the LAN2LAN offers an earlier IPX PPP implementation along with IPXWAN, the Newport router also was able to send and receive IPX PPP transmissions from the Cisco, 3Com, and Wellfleet routers tested.

Now that the IPXWAN RFC has been published, all other router makers involved in our tests have promised to adhere to the PPP standard.

Some incompatibility problems, such as those affecting AppleTalk interoperability, will be more difficult to solve because they relate more to core routing functionality than differences in PPP implementations. Of all the protocols we ran, AppleTalk was the most problematic; although six of the eight routers tested offered AppleTalk PPP support, only four AppleTalk tests were completed successfully.

A big part of the problem is that the AppleTalk RFC leaves too many openings for vendor interpretations. One grey area that directly causes problems is that the specification allows vendors to run a pair of WAN routers either as half routers or full routers. Under the half router model, the two routers at the ends of WAN link are treated as a single logical entity, which means the WAN link does not get its own network number. Full routers, on the other hand, are treated as separate logical entities, and the WAN link between them has its own address. The end result is that half routers and full routers cannot communicate. Of the products tested, the ACC Nile and Novell MPR run as AppleTalk half routers, while

The PPP Interoperability Test Bed

To measure PPP interoperability among the eight routers in the test group, Winterfold Datacomm decided to use a simple but classic layout; two sites running Ethernet LANs, joined by a single WAN link. If routers could communicate at this basic level, scaling to bigger networks would be a reasonable assumption.

In the test, client systems sent traffic across an Ethernet into one test router, which then used PPP to send that data across an X.21 simulator running at 64-Kbps to the second router being tested, which then sent the data to a second Ethernet connected to a group of host systems (see the figure). 10Base-T hubs served as the Ethernets.

We used PCs to act as NetWare IPX and TCP/IP clients, and an Apple Macintosh to generate AppleTalk traffic. To avoid pairing these with three separate host systems, we used a NetWare file server and added Novell's NetWare NFS and NetWare for Macintosh to put IPX, TCP, and AppleTalk protocol stacks on the same machine.

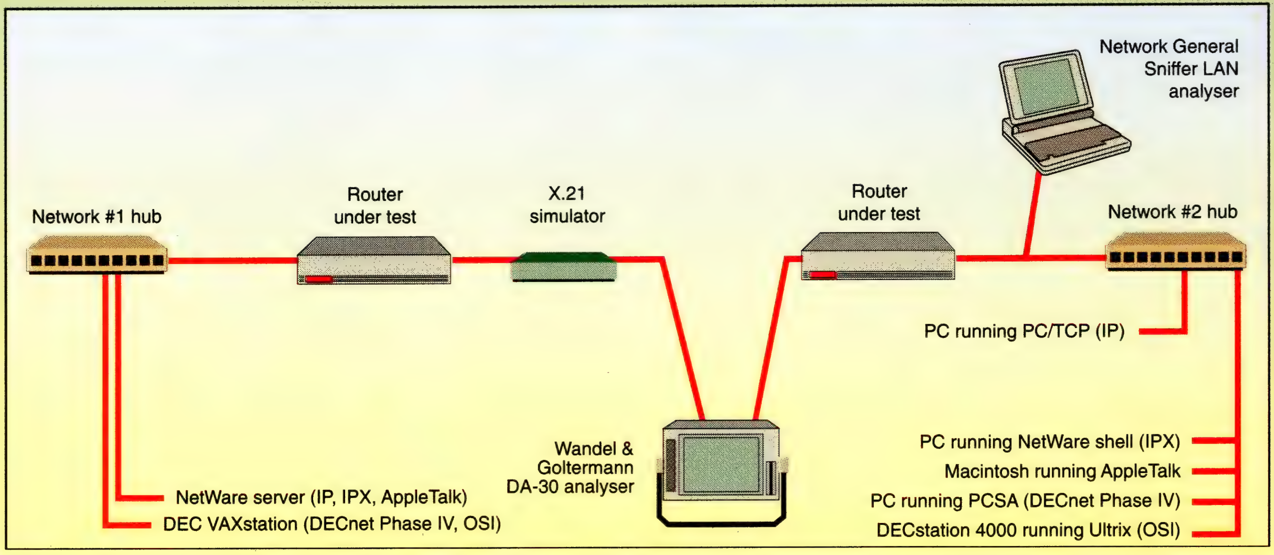
Our DECnet and OSI CLNP tests required additional equipment. We used a PC running DEC Pathworks for DECnet Phase IV, and a DECstation 4000 running Ultrix for OSI CLNP. We used the following for our test traffic:

- *TCP/IP:* Repeated FTP (file transfer protocol) transfers between a NetWare 3.11 file server running Novell's NetWare/NFS (Network File System) and a PC client running PC/TCP software supplied by FTP Software.
- *AppleTalk:* Folder copying between a NetWare 3.11 server running NetWare for Macintosh and an Apple Macintosh client running under System 7.
- *DECnet Phase IV:* Repeated file copying between a DEC VAXstation and a DECstation 4000 running under Ultrix.
- *Transparent bridging:* Same as for the IPX test, but with IPX routing disabled on the routers under test.
- *IPX:* Repeated file copying between a NetWare 3.11 file server and a PC client.

There are several stages in the successful startup of PPP link, and we needed to test them all. The first was the negotiation and startup of the link control protocol (LCP), the low-level protocol on which PPP is based. Next, we needed to evaluate the startup of the high-level protocols configured for the link, with any options set for these. Finally, we needed to watch data as it passed across the link.

As protocol data ran across the link, we ran the application-level tests detailed above to verify that the link was stable. As a last check, we briefly disconnected the WAN link, reconnected it, and watched to see how well PPP recovered in each case. We monitored the link using a DA-30 WAN protocol analyser from Wandel & Goltermann. We also used each router's console facility to monitor the various tables involved.

Richard Thomas


Network General
Sniffer LAN
analyser
Network #1 hub
Router
under test
X.21
simulator
Router
under test
Network #2 hub
PC running PC/TCP (IP)
Wandel &
Goltermann
DA-30 analyser
PC running NetWare shell (IPX)
Macintosh running AppleTalk
PC running PCSA (DECnet Phase IV)
DECstation 4000 running Ultrix (OSI)
NetWare server (IP, IPX, AppleTalk)
DEC VAXstation (DECnet Phase IV, OSI)

the Cisco Model 3000, the Eicon ICS, and the Newport LAN2LAN run as full routers. The 3Com NetBuilder II can use either approach, and the DEC and Wellfleet products tested did not offer an AppleTalk PPP facility.

Even when the approaches match, other differences in AppleTalk PPP implementations often prevent interoperability. For instance, the ACC Nile, which otherwise scored well in the interoperability tests, simply would not communicate with the Novell and 3Com routers in AppleTalk full-router mode.

The problems we had in getting the seemingly compatible AppleTalk PPP routers to communicate were some of the mystery incompatibilities we found during our tests. In most of these cases, the routers under test went through the LCP and control frame stages without incident, and were even able to start passing routing information back and forth. But they just weren't able to exchange user data.

Although determining the cause of interoperability snags was beyond the scope of our test, we were able to use the router's built-in diagnostics to find the sources of some of the problems. For instance, we found that DECnet routing tables sometimes were being only partially updated.

Test Lessons

Despite some of the unexplained glitches, the Winterfold Datacomm tests present a clear picture of the current state of PPP interoperability. TCP/IP's almost universal interoperability is understandable, given that TCP/IP was the first protocol with a PPP RFC spec. Once vendors implement the new IPXWAN RFC, widespread interoperability for NetWare IPX is almost certain.

For other protocols, universal interoperability is less promising. DECnet users are more likely to limit their router choices to DEC products, simply because for them DECnet will be a dominant protocol. AppleTalk is more likely to exist as a minor protocol throughout an enterprise network. In both cases, pressure on vendors to clean up their support for these protocols won't be as heavy as with, for example, IPX.

The interoperability problems we found with AppleTalk suggest that the AppleTalk

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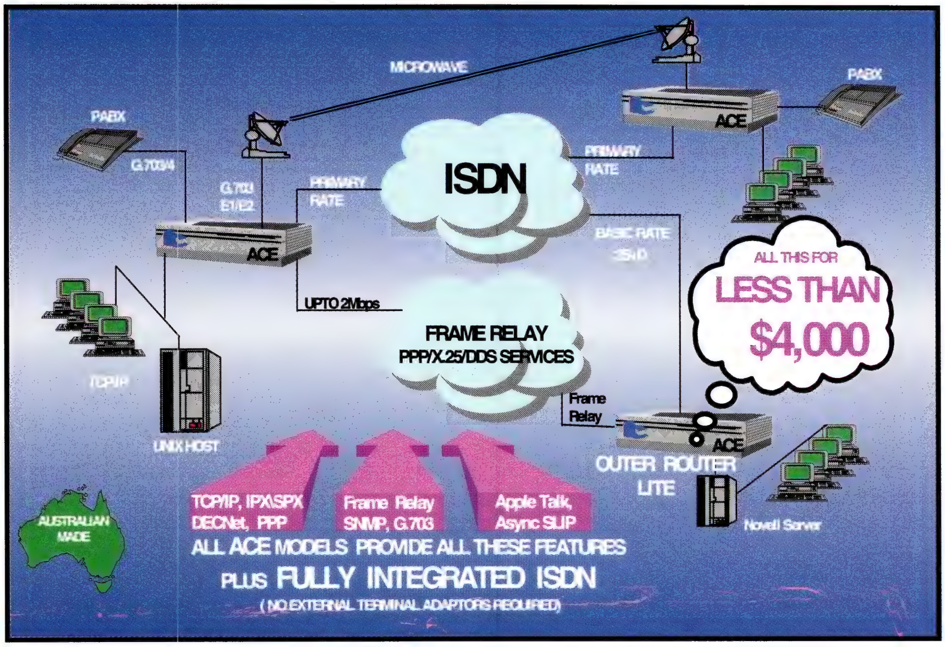

Interlink Communications

Head Office
PH: 02 975 2577
FAX: 02 452 5397

Melbourne Office
PH: 03 822 9831
FAX: 03 822 9980

Canberra Office
PH: 06 257 1885
FAX: 06 257 1998

PPP RFC spec is not rigid enough, leaving router vendors to develop their own ways of filling in the gaps. The AppleTalk Networking Forum has been created make AppleTalk more amenable to large networks; we hope PPP is on its agenda.

Assuming basic interoperability issues are resolved, the next step by router vendors should be to expand PPP to include now-proprietary features that make routers more effective. Compression should be the first item on the expansion list. Many PPP links will be used to connect branch-office environments, typically over low-speed (56 or 64Kbps) WAN links. At these low speeds, compression can be critical. Of the routers we tested, the Eicon, Newport, and 3Com products offer compression, but only in single-vendor setups. The other vendors participating in our tests say they will add compression this year.

PPP's negotiation facility has space for vendors to run proprietary features when linking two of their own boxes. If vendors make more use of this facility, PPP could move toward being the default wide area network protocol even in single-vendor environments, rather than as a multivendor exception. Newport and Novell now use PPP as their default WAN protocol. Such a move would reduce development effort, create better choices for users, and make life far easier for those trying to analyse packets on WAN links.

PPP has gone about as far as it can in terms of vendor compliance with existing RFC documents. What's needed to close the remaining gaps is some real conversation between vendors. Standards now in place need some tightening. Now that the industry is on the right track, RFC guidance words like 'can' and 'should' need to be changed to imperatives like 'will' and 'must.'

Richard Thomas is the Managing Director of Winterfold Datacomm (Surrey, UK), a consultancy that designs and implements LANs and internetworks.

PPP Router Report Card

The following are specific breakdowns for the eight routers included in the Winterfold Datacomm PPP interoperability tests. The figures for the number of tests conducted do not include tests that were aborted because a vendor did not directly support a PPP implementation for a given protocol (see 'PPP Interoperability Scorecard' on page 82 for more information).

ACC NILE

Vendor: Advanced Computer Communications (ACC)
Contact: Ungermann-Bass (03) 696 2006
ADE Network Technology (03) 543 2677
Product: Nile, s/w version 6.3.5
Number of tests conducted: 26
Success ratio: 65.4%
Test notes: Nile runs as a half router only for AppleTalk, but it would not work with other AppleTalk half routers. It also experienced low-level problems that prevented interoperability with the Newport LAN2LAN. Support for the IPXWAN RFC is planned with the release of software version 8.0.

CISCO MODEL 3000

Vendor: Cisco Systems
Contact: Com Tech (02) 317 3088
Product: Model 3000, s/w version 9.21
Number of tests conducted: 29
Success ratio: 75.9%
Test notes: The Cisco runs a 'bare' version of PPP that will not negotiate any parameters; this created problems with the DECnis 500. The Model 3000 also would not bridge to the 3Com router (Cisco says the problem is a bug in the 3Com software), and it uses an OSI CLNP option that the Novell MPR doesn't yet support. IPXWAN support is planned for release 10.0, scheduled to debut shortly.

DEC DECnis 500

Vendor: Digital Equipment Corporation (02) 561 5252
Product: DECnis 500, s/w version 2.2
Number of tests conducted: 18
Success ratio: 77.8%
Test notes: The high success ratio of this product is offset by the fact that the DECnis 500 couldn't be tested for IPX or AppleTalk because it handles those protocols by encapsulating them in IP (the IPX encapsulation does conform to the RFC 1234 standard, however). IPXWAN support is planned for release 2.3, which DEC says it will make available soon.

EICON ICS FOR NETWARE

Vendor: Eicon Technology
Contact: Com Tech (02) 317 3088
JNA Network Services (02) 417 6177
Product: Interconnect Server (ICS) for NetWare 3.1
Number of tests conducted: 18
Success ratio: 55.6%
Test notes: Interconnect Server for NetWare 3.1 uses Novell NetWare's built-in router, although it won't run AppleTalk to the Novell MPR because Eicon uses the full-router model. Link control protocol failure prevented interoperability with Newport LAN2LAN.

NEWPORT LAN2LAN/MPR

Vendor: Newport Systems Solutions
Contact: LAN Systems (02) 901 3655
Product: LAN2LAN/MPR, software version 3.0
Number of tests conducted: 18
Success ratio: 61.1%
Test notes: Newport's LAN2LAN/MPR router, which runs beneath Novell NetWare's built-in router, is the only router tested other than the Novell MPR to support IPXWAN. Problems prevented any interoperability with ACC and Eicon routers. The Newport product, tested here as a PC-based router, also is available as a standalone device, the standalone version includes point-to-point support for transparent bridging.

NOVELL MPR

Vendor: Novell (02) 925 3000
Product: Multiprotocol Router (MPR) version 2.11
Number of tests conducted: 21
Success ratio: 52.4%
Test notes: Novell's IPX support is IPXWAN only; once other vendors add IPXWAN, MPR's interoperability will improve. Novell's PPP implementation for OSI CLNP was written before the relevant RFC appeared. The RFC provides an option to realign data in the PPP frame; MPR's inability to handle this option prevented CLNP interoperability with the Cisco Model 3000. Novell says it will add this option to its next MPR release, along with full-router support for AppleTalk.

3COM NETBUILDER II

Vendor: 3Com (02) 959 3020
Product: NetBuilder II, s/w version 6.2
Number of tests conducted: 29
Success ratio: 86.2%
Test notes: The 3Com router topped all entries in terms of both success ratio and the number of tests conducted. It was the only router tested to handle both half and full-router AppleTalk modes. Due to a software problem, the NetBuilder II could not send transparent bridging data to the Cisco Model 3000.

WELLFLEET LINK NODE

Vendor: Wellfleet Communications (02) 955 2955
Product: Link Node, s/w version 5.77
Number of tests conducted: 21
Success ratio: 85.7%
Test notes: The Wellfleet Link Node version tested did not offer PPP support for AppleTalk or OSI CLNP; support for those protocols, and for IPXWAN, was scheduled for release shortly after these tests. Except for TCP/IP, Link Node didn't run well with the DECnis 500.
Richard Thomas

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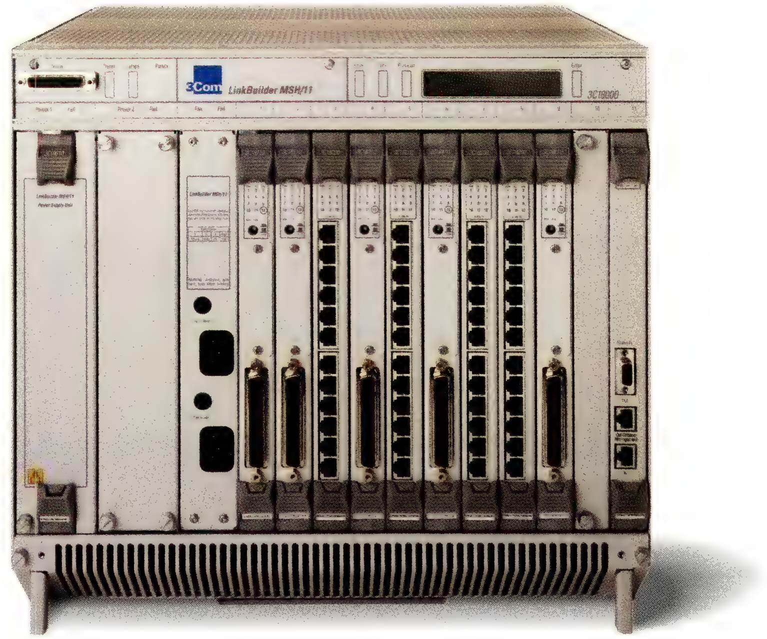

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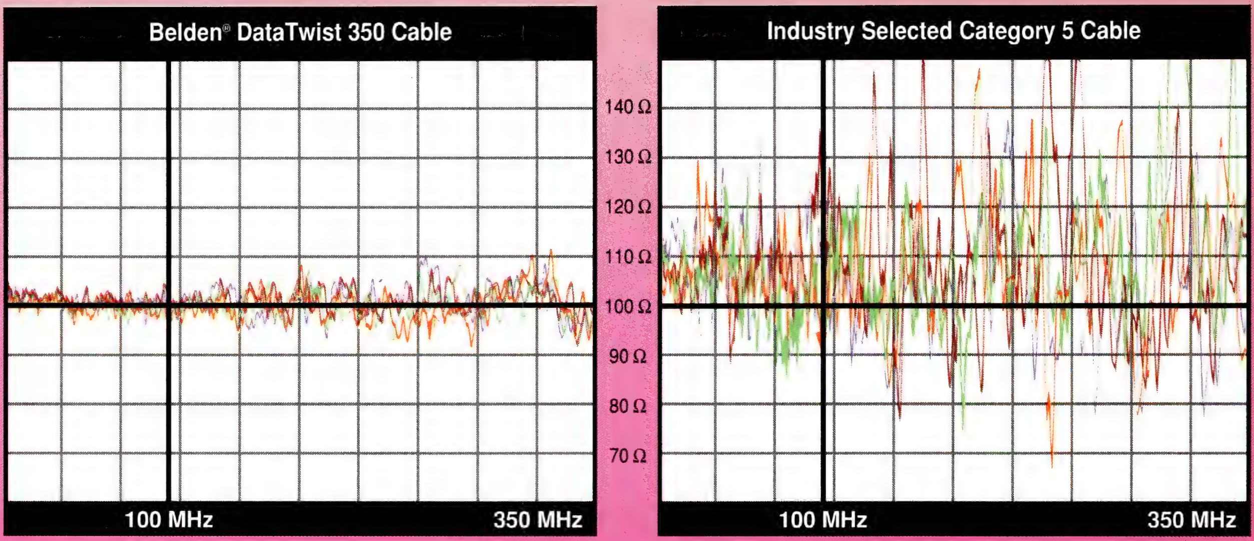

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Kevin Tolly and
David Newman

Evaluating Unix-to-SNA Gateways

The Data Comm Test Lab's hands-on assessments of the latest gateway gear shows that it is surprisingly simple for SNA and Unix to be successfully combined across corporate networks.

Like opposing factions in a religious war, SNA and TCP/IP advocates alike proclaim themselves keepers of the One True Way of enterprise networking. SNA champions argue that recent developments in APPN ensure that their technology will dominate for years to come. TCP/IP zealots claim the inherent strengths of the Unix operating system, such as multitasking and multithreading, make it ideal for multiplatform networks. What both sides best realise, however, is that they've got to live together.

Unix is now the operating system of choice for mainstream applications as varied as financial modelling and point-of-sale terminals. But those applications need access to the terabytes of data stored on SNA mainframes. One answer is to run TCP/IP on the mainframe. But true-Blue users are more likely to take another tack: implementing SNA gateways on Unix machines.

Combining SNA and Unix raises some critical questions: How is SNA delivered through Unix gateways? Can network managers expect the same administrative capabilities as they have in native SNA environments? Will users get the same kind of terminal emulation that's available in PC-based packages?

There's one sure answer to all these questions: It depends. In evaluating four SNA gateways and related Unix client software, the Data Comm Test Lab found wide variations in the quantity and quality of SNA services. The products ran the gamut from full-featured SNA implementations to those that required all transactions to make calls to TCP/IP sockets (see Table 1 on page 90).

We preferred the gateways with the most complete SNA implementations, on the basis that the gatekeepers of corporate mainframes are likely to have years of SNA expertise. Not surprisingly, one of those gateways came from IBM. We also were impressed with the Enhanced SNA from Unisys, particularly with its simple yet powerful gateway management functions. Both products earned Tester's Choice awards.

Net managers with heavy Unix backgrounds and limited SNA experience might be attracted to either of the other two products we tested — the SNA Server from Brixton Systems or the SNA Link Plus from Hewlett-Packard. With their X-Windows interfaces and reliance on IP, both packages show off their developers' Unix expertise. The tradeoff is more limited SNA functionality and, in the case of Brixton, more complex SNA configuration.

The Long View

Buyers of Unix-to-SNA gateways have, in the past, tended to concentrate on features and spent little if any time considering the architectural issues raised by gateway implementations. That's still the case today — and fixating on features is still a mistake. In the long run, architectural considerations will prove far more important than a few bells and whistles.

Unfortunately, there are nearly as many architectures as there are variations on Unix itself. In addition, network managers must decide what networking protocols, topologies, and network management to employ.

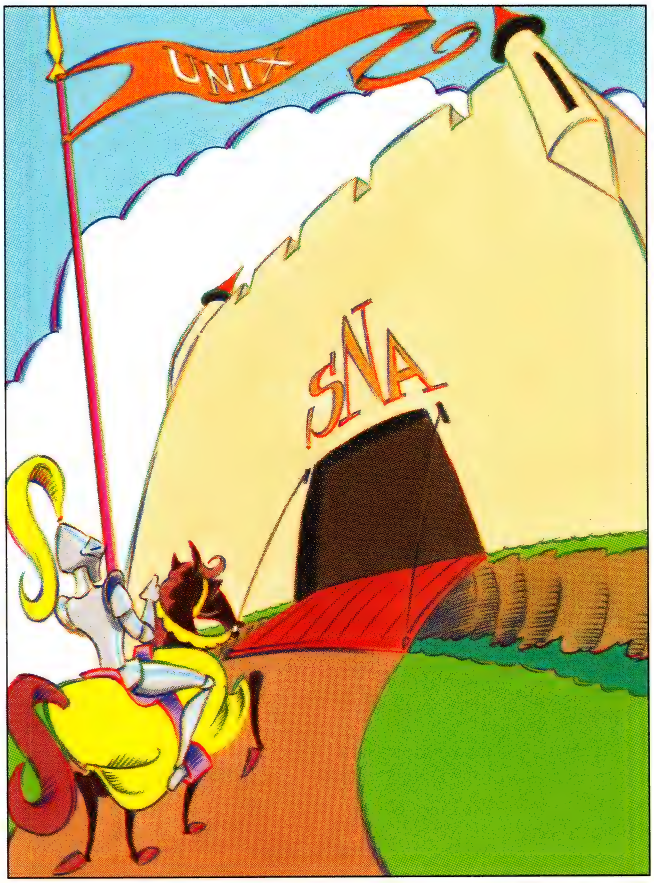


Table 1: Selected Vendors of Unix-SNA Gateways

VENDOR	GATEWAY	RELEASE	PU CONCENTRATION	SPLIT STACK	UPSTREAM CONNECTIONS	DOWNSTREAM CONNECTIONS
Brixton Systems CRS Group (03) 899 8055	BrxPU2.1 SNA Server	2.0 (A new release is now shipping)	No	Yes	Token Ring, Ethernet, SDLC, X.25, frame relay	Token Ring, Ethernet, FDDI, X.25, async, PPP; all require IP connection
Hewlett-Packard 13 13 47	SNA Plus Link	2.0	No	Yes	Token Ring, Ethernet, SDLC, X.25, frame relay	Token Ring, Ethernet
IBM 13 24 26	SNA Server/6000 and SNA Gateway/6000	2.1	Yes	No	Token Ring, Ethernet, SDLC, X.25, FDDI	Token Ring, Ethernet, APPN Connection Network, X.25, SDLC, FDDI
Unisys (02) 963 6000	Enhanced SNA Gateway (e/SNA)	5.4	No	No	Token Ring, SDLC, X.25	X.25, Token Ring, APPN Connection Network,

EN = APPN End Node
LU = Logical Unit
PU = Physical Unit
LEN = Low Entry Networking
NN = APPN Network Node
SDLC = Synchronous Data Link Control

Despite the many possible permutations, all Unix gateways — like their PC and Macintosh counterparts — fall into two basic categories: full-stack and split-stack.

Full-stack schemes, as the name suggests, put the entire SNA protocol stack on all stations attached to the host (see Figure 1). Thus, the only protocol used across the entire link — from host to gateway to client — is SNA. In keeping with SNA nomenclature, full-stack clients are called downstream Physical Units (DSPUs).

There are actually two devices below the host that can be considered gateways. The first is the device that's channel-attached to the host, such as a 3745 front-end processor (FEP), 3172 or 3174 communications controller, or Integrated Communications Adaptor (ICA). Any of these communicate with the second gateway — in this test, a Unix machine that in turn communicates with end-stations.

Split-stack schemes run SNA between host and gateway; from the gateway to the client, however, anything goes. TCP/IP is the obvious choice in the Unix world, although the Unisys gateway also supports IPX, OSI, and X.25 (HP and IBM can handle X.25 as well.)

Brixton's software employs TCP/IP sockets, thus *requiring* that an IP process occur between gateway and client — even if it's within a single machine. Brixton officials said support for IPX clients has been added in the new release of the software, which started shipping in April.

Split-stack implementations predominate among Unix gateways — not surprising, given Unix's TCP/IP heritage and its ability to support hundreds of sessions. What's more, the 'split' needn't be at the gateway. It's possible to use SNA out to the terminal emulator, and for users to reach it via TCP/IP's Tn3270, which allows users to remotely log on to the host. In this scenario, the gateway and client software can reside on the same machine. Thus, the host sees all SNA PUs and LUs (Logical Units), but the protocol stack on the user's machine is actually TCP/IP.

Full Stack or Split?

As we've said in earlier gateway tests, the full-stack approach certainly simplifies life for network managers. But it shouldn't be viewed as an automatic choice. Split-stack designs offer a wider range of connectivity options to clients — a factor that could be important in Unix environments. What's more, the split-stack approach costs far less to implement.

With full-stack implementations, network managers needn't worry about adding a new protocol to the backbone or supporting one on devices scattered throughout the enterprise. And with only SNA on the backbone, all devices can be managed by host NetView. As soon as another protocol is introduced, network managers must commit to two network management systems: NetView for the host and all devices attached using SNA and an SNMP-based or proprietary system for everything else.

SNA has another advantage over other protocols in that it doesn't generate anywhere near as much overhead traffic, such as ARP (address resolution protocol) broadcast frames. Instead, it sends a single broadcast frame to the MAC (media access control) address of the gateway at session initiation in a process known as source route discovery.

The full-stack approach also allows net managers to mix and match different vendors' gateway and client software. As long as all packages implement SNA correctly (the client appears as a DSPU), interoperability is assured.

But a pure full-stack approach requires that every client be defined on the host — a cumbersome task at best. A variation on this scheme, known as PU concentration, allows the gateway to terminate the various DSPUs and then present the host with a single PU. Of the vendors in this test, only IBM offers PU concentration, which eliminates the need to define multiple PUs in VTAM, the control program on the host. That's a major plus, both in terms of convenience and in situations where VTAM access is limited or where net managers are unfamiliar with VTAM procedures.

The tradeoff is a loss of some management control. A PU concentrator gateway can theoretically support hundreds of downstream LUs per PU, though the number typically ranges from four to 32 per client. All of them, however, will appear as a single DSPU to NetView running on the host. As a result, some gateways don't allow NMTV (network management vector transport) alerts to be exchanged between client and host. All vendors have ways of remapping LU addresses between host and client, but PU concentration inherently limits the ability of host NetView to see all PUs located downstream. As is the case with split-stack gateways, the PU concentrator gateway must remap the LUs' addresses for them to be seen by the host.

Simpler Management

Split-stack implementations are less problematic in the Unix world than they are when PCs or Macintosh gateways are concerned. That's because the protocol most often used to link Unix gateways and clients, TCP/IP, is an open standard. PC and Macintosh split-stack gateways, in contrast, typically use proprietary protocols to connect gateway and client, thus locking users into a single vendor's products. With

DOWNSTREAM PROTOCOLS	CLIENT OPERATING SYSTEMS	MAXIMUM SIMULTANEOUS PUs	MAXIMUM LUs/MAXIMUM CLIENTS PER PU	POOLS/ CLASSES OF LUs	DEFAULT LU	LUs AND PUs SUPPORTED
SNA, TCP/IP, IPX	Solaris for Sparc and Intel, SunOS, AIX, HP-UX, UnixWare, SCO Unix, Sequent, Windows NT	32 (Unlimited in new release)	254/254	No/No (Yes/Yes in new release)	No	LU1, 2, 3, 6.2; PU2.1 (LEN)
TCP/IP	HP-UX, OS/2, DOS/Windows	255	254/254	Yes/Yes	No	LU0, 1, 2, 3, 6.2; PU2.0, 2.1 (LEN)
SNA, TCP/IP	AIX, OS/2, DOS/Windows, any PU2.0 or PU2.1 implementation	255	254/254	Yes/Yes	Yes	LU0, 1, 2, 3, 6.2; PU2.0 and 2.1 (LEN, EN, and NN)
SNA	OS/2, any Unix supporting APPC	1 over Token Ring; 2 over SDLC; 8 over X.25	254/254	Yes/Yes	No	LU0, 1, 2, 3, 6.2; PU2.0, 2.12 (LEN)

TCP/IP as the transport, any vendor's Tn-3270 application can access client and gateway software.

Split-stack gateways that employ TCP/IP are also a lot less expensive than their full-stack counterparts, especially for large numbers of users. In fact, savings can run to hundreds of thousands of dollars — one reason why even IBM, which has the most robust full-stack capabilities of all, recommends that its products be deployed in a split-stack approach.

Making the Connection

Connectivity is yet another issue net managers face when selecting a gateway. Not long ago, they could opt for coax, SDLC, or Token Ring to the host. These days, the same links also can be made via Ethernet, frame relay, and X.25. From gateway to clients, the choices include all the foregoing as well as dial-up async, PPP (point-to-point protocol), and IBM's APPN Connection network. Notably, the topology used from client to gateway can differ from that used from gateway to host.

When the Lab sourced product for this test, it asked vendors to supply Ethernet connections from the client to the gateway and from the gateway to an IBM 3172 communications controllers. The assumption was that Ethernet would be the logical choice for products running Unix. Surprisingly, all the vendors supplied Token Ring connections. Unisys, in fact, doesn't even support SNA connections to the client over Ethernet. By choosing Token Ring, Unix vendors apparently are making a bid to be good citizens in the SNA world. Ironically, IBM is now embracing Ethernet connections to the host, and pledges to support FDDI connectivity soon. Brixton too, says it will deliver frame relay to the host sometime this year.

Eventually, it's likely that ATM (asynchronous transfer mode) and WAN transports like ISDN will be added. The growing number of connectivity options is good news, but it will also require a greater understanding of architectural implications.

The Administrative Angle

Once the gateway and all the connections are in place, net managers need a way to administer the link and the sessions it carries. Some important management features include control of the configuration file, statistics gathering, trace and security functions, and support for host NetView.

A gateway's configuration file is critical, since it defines how client addressing information must be remapped before being passed onto the host. Safeguards are needed to ensure that the file doesn't become corrupted, as can happen when new entries are added. Commendably, HP and IBM both have a verify function that won't accept invalid entries; in the Lab's view, all vendors would do well to follow this lead. IBM's gateway also generates a backup copy of the configuration file, giving net managers a way to revert to their original setup.

The HP, IBM and Unisys management utilities simplify configuration by adhering to IBM's Common User Access (CUA) interface. CUA presents a series of character-based, fill-in-the-blank menus. Information entered is then inserted into the actual configuration files. For network managers who have mostly SNA backgrounds, CUA interfaces help flatten the learning curve by shielding much of Unix's complexity.

Brixton's gateway, in contrast, requires direct editing of configuration files. This

Figure 1: Taking Stock of Full and Split Stacks

In the full-stack scheme, both the gateway and the client run the complete SNA protocol stack to communicate with the host. With the split-stack approach, the gateway relies on SNA to talk to the host but can use another protocol, such as TCP/IP, to reach the downstream client. Split-stack gateway and client software may also reside on the same machine, which users reach via TCP/IP's Tn3270.

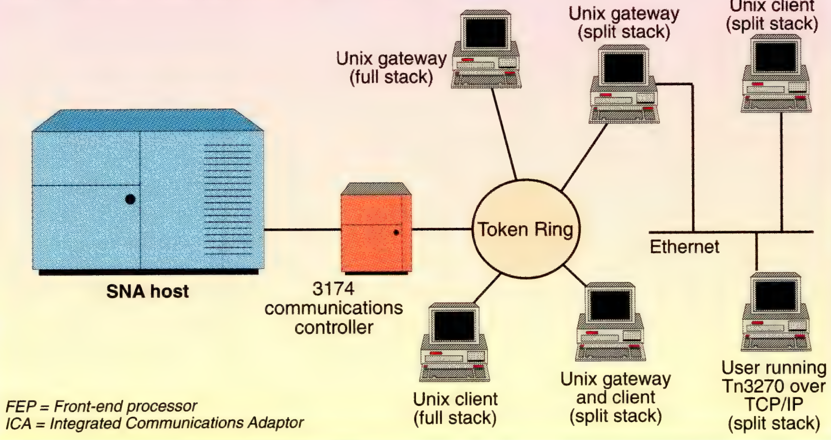

Unix gateway (split stack)
Unix client (split stack)
Unix gateway (full stack)
SNA host
Token Ring
Ethernet
3174 communications controller
Unix client (full stack)
Unix gateway and client (split stack)
User running Tn3270 over TCP/IP (split stack)
FEP = Front-end processor
ICA = Integrated Communications Adaptor

Table 2: Emulation Evaluation

VENDOR	PRODUCT	RELEASE	3270 EMULATION MODELS 2, 3, 4, 5	3270 PROGRAMMING	3270 LANGUAGES	LU1, LU3
Brixton Systems CRS Group (03) 899 8055	Brx3270	2.0 (A new release is now shipping)	Yes	HLLAPI, EHLLAPI, scripts, macros	C++	Yes
Hewlett-Packard 13 13 47	SNA Plus 3270	3.0	Yes	HLLAPI, EHLLAPI, scripts, macros[1], proprietary API	C++	Yes
IBM 13 24 26	SNA Server/6000 and AIX 3270 Host Connection Program/6000 (Hcon)	SNA Server/6000, 2.1; Hcon,1.3.1	Yes	HLLAPI, EHLLAPI, scripts, macros	C++, Fortran, Pascal	Yes
Unisys (02) 963 6000	Enhanced SNA 3270	5.40	Yes	HLLAPI, proprietary API	C	Yes

APPC = Advanced Program-to-Program Communications
HLLAPI = High-Level Language Application Program Interface
CPI-C = Common Programming Interface for Communications
EHLLAPI = Emulator High-Level Language Application Program Interface
CSV = Common Service Verbs

approach plunges network managers into the complexities of both SNA and Unix. Editing a raw configuration file on the gateway is just as sensitive (and as intimidating to those unfamiliar with SNA commands and syntax) as editing mainframe VTAM configuration fields.

Brixton's files mimic the macro and keyword format VTAM/NCP (VTAM/Network Control program). Bit since Brixton's files (and those of VTAM/NCP) use a format that resembles assembly language, the task is anything but simple.

All the vendors tested allow configuration files to be backed up as standalone files. IBM's gateway also allows the file to be migrated to new releases of gateway software as they appear and to be exported to other gateways.

Session Census

In addition to handling client configuration tasks, the gateway also must be able to collect session statistics. All gateways in this test supply basic information such as the number of active LUs, enabled LUs (as defined in the configuration file), and active sessions. The number of active LUs and sessions can differ; for example, an LU can be active to VTAM but not in session with a VTAM application such as CICS (Customer Information Control System).

All the gateways also furnish information about the identity of downstream clients, although details vary by vendor. The HP and Unisys gateways identify downstream sessions by PU and LU type. IBM's gateway does the same and also supplies MAC addresses of clients. Brixton said the new version of its software has the capability of displaying user identity and MAC address.

Another way to figure out what's going on between gateway and client is with the trace function. Like the data captured by protocol analysers, traces allow network managers to walk through session data on a frame-by-frame basis — a very handy feature when it comes to troubleshooting or performance tuning.

Security is yet another concern. At a minimum, the gateway should be able to protect the configuration file with a password. More critically, it should also be able to send an UNBIND command to the host when a client connection drops. Otherwise, the next client could enter into another user's mainframe session — without being noticed by the security subsystem on the mainframe.

As with other areas of gateway management, however, the Data Comm Test Lab found that security features varied by vendor. Neither Brixton nor Unisys allow password protection of configuration files within their gateway management software, although both vendors' files can be password-protected via Unix commands. Hewlett-Packard and IBM, in contrast, allow password protection.

Client Considerations

Architectural and administrative concerns are important to network managers, but for users the thing that counts is how the SNA session appears on their workstation. When it comes to terminal emulation, features and functionality are what count most.

As a group, the Unix-based terminal emulators we evaluated don't have as rich a feature set as some PC and Mac-based products — surprising, given that the X-Windows interface can be customised far more extensively than DOS, Windows, OS/2, or the Mac operating systems. In terms of functions, though, all the emulators supplied a serviceable link to the host.

Regardless of their appearance, most emulators offer the same core set of functions (see Table 2.) These include:

- *Display options:* All gateways in the test offer the common screen sizes used in 3270 terminal emulator (LU2) applications — Models 2, 3, 4 and 5. Brixton's product also supports LU2 Model 1, an archaic 40-column-by-12-row mode. And only Brixton allows the window to be enlarged (and type size to be scaled up) to take advantage of the large monitors used with Unix workstations;
- *3270 APIs:* One area in which Unix emulators outshine PC and Macintosh products is in support for IBM's Emulator High-Level Language Application Program Interface (EHLLAPI). All the vendors except for Unisys work with EHLLAPI, which gives developers a standard way of accessing 3270 functions. Unisys relies on a proprietary API that forces developers to learn new conventions when writing code. EHLLAPI is a superset of functions like scripting and macros, so products that accommodate this API also allow tasks like automatic log-on and mapping of multiple strings to one keystroke. Brixton and IBM also feature scripting and macros as standalone features; HP's client software only allows macros through EHLLAPI function calls;
- *File transfer:* All four vendors support IND$FILE, the hot program that is the de facto file-transfer standard for 3270 sessions. Further, all the vendors work with the VM/CMS, CICS, and TSO versions of IND$FILE. That's where the similarities end.

The Lab found significant differences between VM/CMS products in terms of IND$FILE performance (see Figure 2). Indeed, the fastest performer, Unisys, was able to copy a 1MB text file from host to client in one-quarter the time needed by the slowest gateway, Brixton. Unisys and IBM turned in strong showings for file transfers, thanks to user-definable buffer sizes. HP also allows the buffer to be increased, but this did not improve performance.

IND$FILE FILE TRANSFER MODES	APPC PROGRAMMING	APPC LANGUAGES	LEN NODE (PU2.1)	APPN END NODE
Manual	CPI-C, CSV, proprietary API	C++; Cobol or Fortran through calls to object libraries in C	Yes	No
Manual, automatic, scheduled	CPI-C	C++	Yes	No
Manual, automatic	CPI-C	C++	Yes	Yes
Manual, automatic, scheduled	CPI-C, CSV	C	Yes	No

LEN = Low Entry Networking
PU = Physical Unit
LU = Logical Unit
1. Macros accessed through EHLLAPI

- *Printing:* Since most users can print 3270 session data locally, LU2 is usually all that's needed. For 3270 host printing, all the packages also support LU1 SNA Character Set (SCS) and LU3 3270 datastream printing;
- *APPC:* All emulators in this test accommodate Advanced Program-to-Program Communications (APPC, also known as LU6.2), and all vendors allow programming via CPI-C (Common Programming Interface for Communications), IBM's interface to APPC functions.

Support for APPN Advanced Peer-to-Peer Networking, in contrast, is nowhere near as extensive. Only IBM allows clients to function as APPN End Nodes; the rest of the vendors deliver only the lowest level of APPN, Low Entry Networking (LEN, also known as PU2.1).

Price Points

Because vendors take vastly different approaches to gateway and client configuration, it's extremely difficult to compare prices on a per-product basis, so we tried another tack: We asked vendors to supply prices on a *per-user* basis for 1, 32, 64, and 128 users (see Table 3 on page 94). We assumed that each would run one LU session and asked each vendor to determine the number of gateway and client packages that would be needed.

HP came in with the lowest price point — just $5,200, regardless of the number of users. But HP assumes that users will run TCP/IP on their machines and connect to the emulator and gateway using Tn3270 over TCP/IP. The drawback to this approach is that it effectively masks the endstation from host NetView.

IBM also recommends having users connect to a limited number of emulators over Tn3270. For 128 users, this costs around $25,000, a price that's a lot easier to swallow than what it would cost to put emulator software on every machine. IBM says the latter scheme puts far more power on each user's machine than is needed. But Tn3270 only allows 3270 sessions; an SNA stack is required on all end-stations to run CPI-C applications. Further, Tn3270 would necessitate two systems for end-to-end network management — host NetView and an SNMP-based package.

Brixton and Unisys both load emulator software on all users' stations. For 128 users, Unisys comes in at just over $9,500, while Brixton costs more than $27,000. Notably, HP client stations don't appear to the gateway as DSPUs, since communications between client and gateway are made over TCP/IP.

Brixton Systems

Brixton's attitude to SNA gateways might be described as 'the more Unix, the better.' The vendor's split-stack BrxPU2.1 SNA Server gateway accommodates clients running a wide range of Unix variants and allows virtually any topology to be used downstream. But all these links are established through TCP/IP sockets rather than SNA, which means clients can't be managed by host NetView.

Worse, Brixton's gateway is the only one tested that didn't use menus to guide net managers through configuration changes. Arcane SNA configuration data is kept in Unix text files, which are accessed through equally arcane Unix editing tools. Brixton's gateway also lacks an internal method of password-protecting of backing up the configuration file.

One minor irritation was that once LUs are defined, that gateway doesn't tell network managers if they're active. On the client side, we found Brx3270's keyboard-remapping facility difficult to use, a situation made worse by the absence of context-sensitive help.

In its favour, the Brixton gateway allows clients to run on a long list of operating systems, including Solaris (which we used, running on a Sun Sparcstation 2), SunOS, AIX, HP-UX, UnixWare, Sequent, SCO Unix DOS/Windows, and Windows NT. Support for downstream connections using IPX has also been added in the new version.

Brixton also was the only vendor to allow 3270 session windows to fully take advantage of the large, high-resolution displays which are often used in conjuction with Unix workstations. Notably, the entire link from host to gateway to client can run over SNA; the only requirement is that an IP process occur somewhere along the way, even if it's within a single machine.

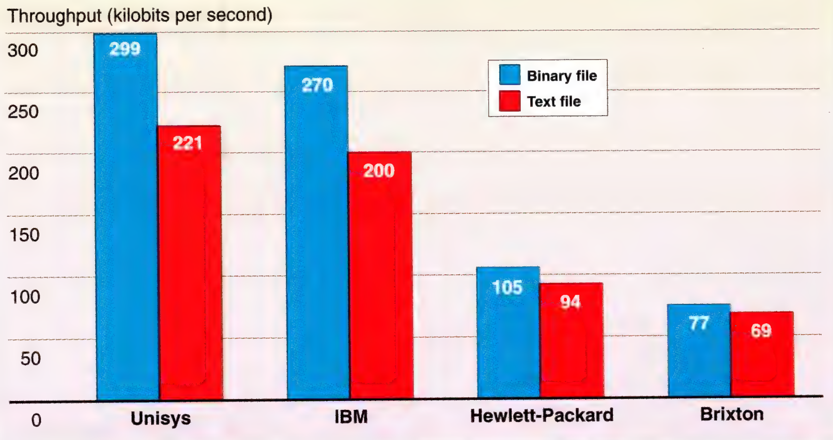
Note that the latest release of Brixton's software was not available for this test.

Hewlett-Packard

HP's SNA Link Plus is a split-stack gateway that's written to IP sockets, just like Brixton's. Unlike the Brixton product, however, HP's configuration changes are accom-

Figure 2: IND$FILE File Transfers

1-Mbyte file copied from host to client



Test Methodology

Of the nine vendors invited to participate in this test —Brixton Systems; Cleo Communications; Eicon Technologies; Hewlett-Packard; IBM; Openconnect; Sunconnect; Tangram Enterprise Solutions (formerly Rabbit Software); and Unisys — five declined: Cleo, Eicon, Openconnect, Sunconnect, and Tangram.

We asked the four participants to supply gateway and client software, preferably loaded onto separate machines. We also specified that connections to the host — an IBM 9370 host running VM and VTAM 3.4 — be made using LLC2 (Logical Link Control 2) rather than SDLC (synchronous data link control).

Our call for product requested that vendors supply Ethernet connections to an IBM 3172 communications controller; however, all vendors supplied products that supported 16Mbps Token Ring links. A 3172 controller could not be configured in time for inclusion in this test. Instead, the host was equipped with an IBM Integrated Communications Adaptor, a Token Ring card that appears to downstream units as a generic SNA gateway.

Vendors were free to use protocols other than SNA for gateway-to-client communications. Nearly all our end-station evaluation centred on 3270 emulation, but we did ask vendors if they support RJE (remote job entry) emulation. In addition to checking for 3270 emulator functions like keyboard mapping and file-transfer history, we also performed IND$FILE file transfers to evaluate gateway and client performance. We copied two 1MB files (a text file and a file containing precompressed data) from the host to the end-station and measured transfer times using an Expert Sniffer from Network General. File-transfer setup and teardown were counted as part of transfer times.

The lab also evaluated gateway management functions, including the ability to gather statistics (such as number of active sessions and users); security; and portability of configuration file. Gateway architecture, connectivity options, operating system support, types of LUs, and maximum number of PUs, LUs and clients also were appraised.

Kevin Tolly and David Freeman

plished via a straightforward series of menus that conform to IBM's CUA interface. They can be used to define downstream LUs, pools and classes of LUs, and other end-user information. What's more, HP's gateway and SNA Plus 3270 client software were the least expensive of any we tested, especially for large numbers of users.

As a split-stack product, HP's gateway simply passes DSPU information up to the host. It allows as many as 255 PUs per attachment, and it also accommodates 254 clients and LUs per PU. Like all split-stack gateways, HP's product prohibits host NetView from receiving NMVT alerts from client stations.

Once LUs are defined, the gateway displays standard session information such as whether sessions are active, which host applications are in use, and when each process began. Commendably, HP's gateway includes a response time monitor (RTM), which works with host NetView to have the host resend data after a user-defined interval. RTM makes sure that users don't have to wait too long for data or lose sessions due to timeouts. We did come across one quirk we didn't like on the connection management menu, where the default choice is to deactivate the link. This could cause network managers in a hurry to accidentally terminate current sessions.

On the client side, we found that HP's software supplied most standard emulator features, including support for LUs 0 through 6.2, EHILLAPI, and CPI-C. We did find two minor shortcomings in HP's client software. First, even though the X-Windows interface allows a 3270 session window to be maximised, the screen froze when we tried to do so. Second, HP's client software doesn't directly support macros even though it does allow scripting; to get macros, users must write EHLLAPI routines. HP also allows gateway connections from DCA's Irma Workstation.

IBM

It's no surprise that even on Unix platforms IBM offers every SNA function in the universe. But it was something of a shock to learn that IBM recommends a split-stack scheme that has users connecting its gateway and client software over TCP/IP.

There are three components to IBM's Unix-to-SNA approach. AIX SNA Server/6000, which runs on both gateway and

Table 3: Price Points

Configurations assume 1 LU2 (3270 session) per client

VENDOR	SOFTWARE PRICES	1 GATEWAY and 1 USER	1 GATEWAY and 32 USERS	1 GATEWAY and 64 USERS	1 GATEWAY and 64 USERS
Brixton Systems CRS Group (03) 899 8055	BrxPU2.1 SNA Server (gateway), $1,825; Brx3270 (3270 emulator) $1,825	$5,474	$16,423	$16,423	$27,372
Hewlett-Packard 13 13 47	SNA Plus Link (gateway), $3,285; SNA Plus 3270 (emulator) $1,545; SNA Plus RJE $2,365; SNA Plus API $2,910	$5,200	$5,200	$5,200	$5,200[1]
IBM 13 24 26	SNA Gateway/6000 $7,500; SNA Server/6000 (required on gateway and client) $1,327 to $10,620; Hcon (3270 emulator) $1,792	$11,948	$14,602	$19,912	$25,222[2]
Unisys (02) 963 6000	Enhanced SNA Gateway from $345 (1 gateway, 1 user); Enhanced SNA 3270 (3270 emulator), unlimited users $3,614; RJE emulator, unlimited users $3,103; proprietary 3270 API, unlimited users $2,829	Varies	$3,378	$5,500	$9,586

1. Assumes one gateway and one client. Users connect to client via Tn3270 over TCP/IP
2. Assumes one gateway and two clients. Users connect to clients via Tn3270 over TCP/IP

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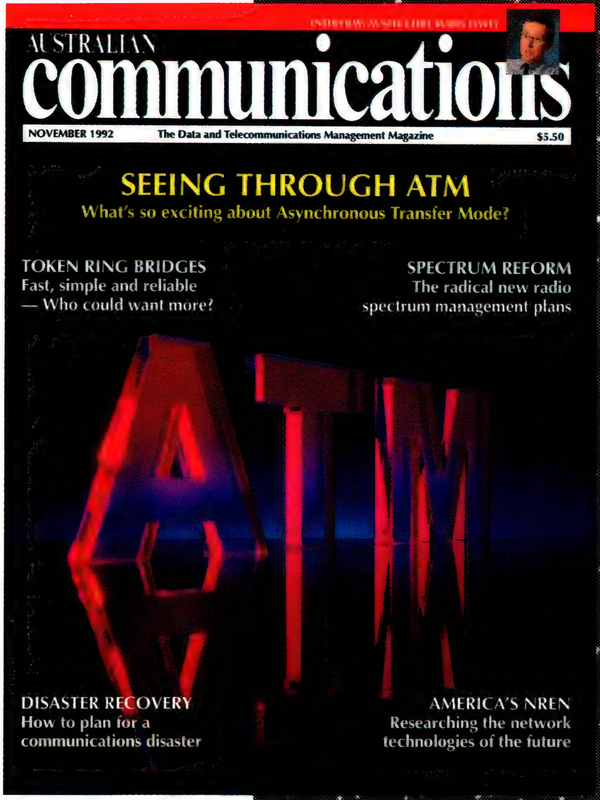
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client machines, loads the SNA stack for peer-to-peer (APPN) and hierarchical subarea SNA networking. AIX SNA Gateway/6000, which runs on top of SNA Server, functions either as a PU concentrator or as a split-stack gateway. AIX/3270 Host Connection/6000 (Hcon) is IBM's client software for RS/6000 workstations.

IBM indicates that deploying Hcon on every user's machine for 3270 sessions is overkill. Rather, it recommends setting up one gateway and a limited number of Hcon 'servers' (one copy of Hcon for 64 users, two copies for 128 users). Users then connect to Hcon, which can be loaded on the same machine as the gateway software, using TCP/IP's TN3270 application. Because TCP/IP connections can't be managed by host NetView, IBM also recommends using its SNMP-based NetView/6000 network management system.

At the gateway itself, IBM offered the most complete version control and change management of any vendor in the test. Configuration data is entered through CUA-compliant interfaces. Other management features allow the configuration file to be verified, backed up, imported, and exported, all without exiting the gateway program. One minor problem was that an update message from the host overwrote a screen display.

On the client side, the character-based Hcon software furnishes a basic but serviceable emulator. Among its features are EHLLAPI for 3270 emulation and CPI-C for APPC programming. Hcon is the only client package we reviewed which supported APPN End Node capabilities.

We tested IBM's products in a full-stack configuration using an RS/6000 Powerstation 230 for the gateway and a RS/6000 Powerstation 220 for the client.

Unisys

Unisys takes the full-stack approach to an extreme; it requires that SNA client *and* gateway software reside on every user's machine. For all that, the vendor delivered solid management capabilities and excellent file-transfer performance at a competitive price.

Unisys offers a full line of host connectivity products under the Enhanced SNA (e/SNA) banner. The gateway module, e/SNA Gateway, resembles HP's and IBM's products in that it offers a character-based, CUA-compliant interface.The Unisys gateway also includes a response time monitor to help guard against session timeouts. On the downside, the gateway supports just one upstream PU over Token Ring, even though it's not a PU concentrator gateway.

Unisys's client software, e/SNA 3270, is also character-based. Functions like session initiation, file transfer, and keyboard remapping are all activated through menu choices or key combinations. Notably, e/SNA 3270 lacks support for EHLLAPI, which severely reduces 3270 programming capabilities.

When it came to 3270 file transfer; however, Unisys was tops in our test. In fact, it was the fastest 3270 client we've ever tested. (For our tests, Unisys supplied its software on its PW2 Advantage Plus, a Pentium PC running Unisys' version of Unix system V Release 4.) The vendor's strong showing came after we increased the gateway's structured field size to the maximum setting of 32KB; curiously, HP's product offered no boost in performance when we changed the same setting.

Unisys says an upgrade to its e/SNA scheduled for release later this year will offer X-Windows interfaces, split-stack implementations, and downstream connections via TCP/IP.

Kevin Tolly is President of the Tolly Group, based in Manasquan, New Jersey. David Newman is testing editor for Data Communications magazine. All research and testing was performed by Wayne Schiller of the Tolly Group.

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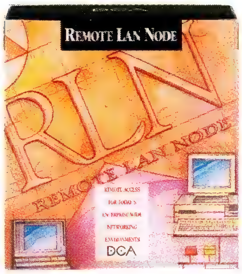

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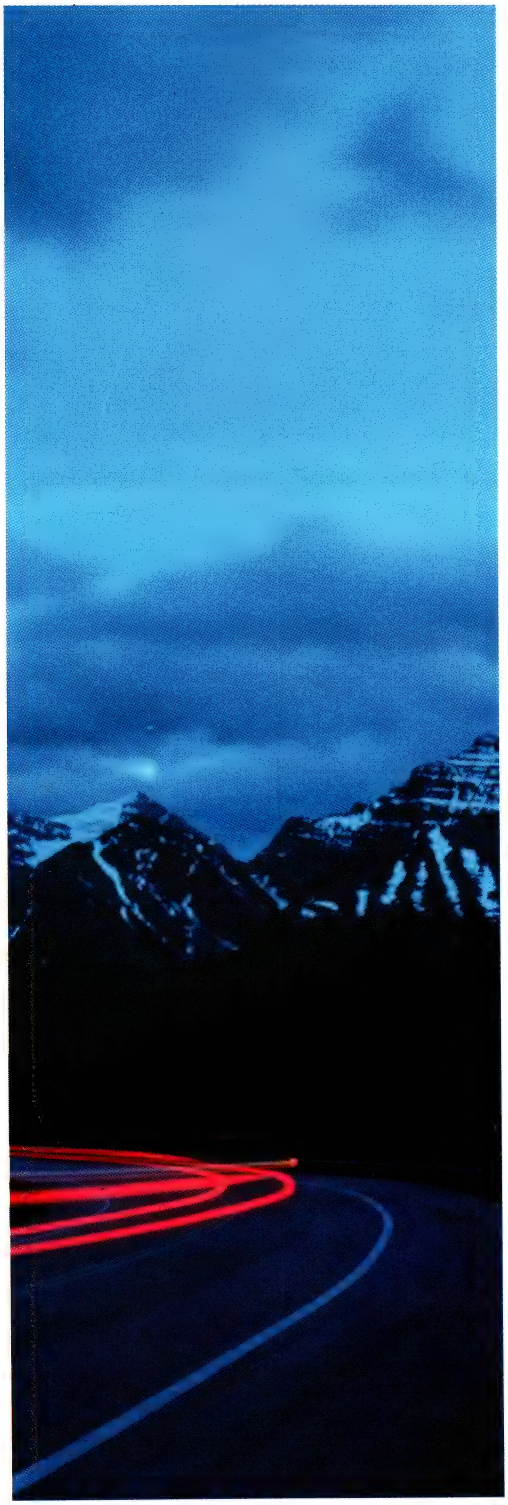

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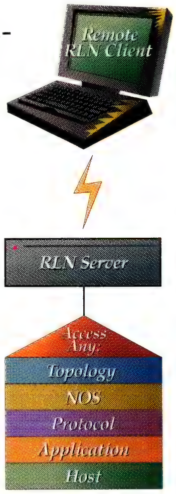

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ATUG - The Exhibition and Conference of the Australian Telecommunications Users Group is unquestionably the major communications event in Australia. Visitors to the annual event are widely considered to be the region's top communications professionals, responsible for the lion's share of its networking and telecommunications purchasing.

Upon registering at ATUG'93 visitors were requested to indicate the communications/networking publications they regularly read. Judging from the **4,690*** completed questionnaires *Australian Communications* is clearly the choice of communications professionals

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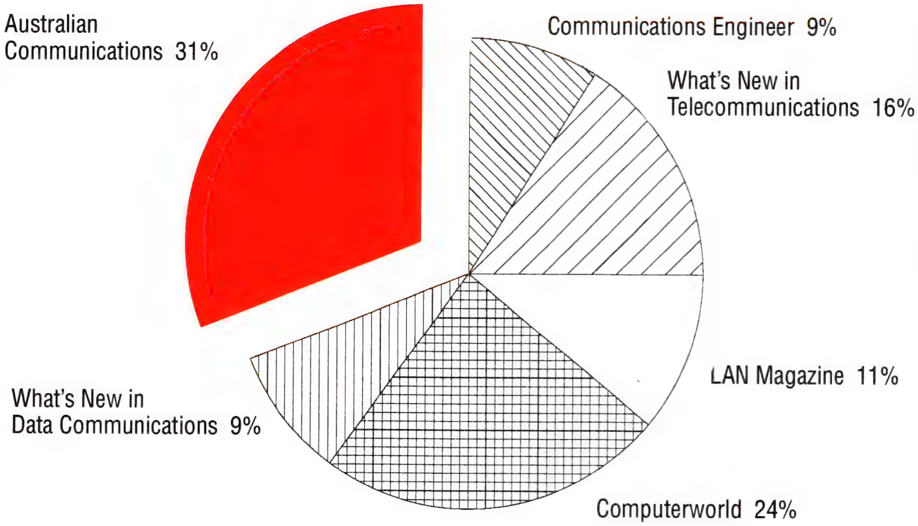

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Lightweight Mobile Phone

Nokia has released its lightest-ever analogue cellular phone, the Model 232 analogue micro-portable. In its lightest configuration (using a NiCad battery) the 232 weighs just 185 grams. It includes a large two-line 16-character display, four dedicated one-touch dialling keys, and a range of programmable features.

Used with its standard Nickel Metal Hydride (NiMH) battery, the 232 weighs 200 grams, and provides 70 minutes talk time and 15 hours standby time. It is compact, measuring 147mm by 54mm by 23.1mm, and features 98 alphanumeric locations, each of which are capable of storing 30-digit phone numbers and 16-digit character names.

Included in the phone's advanced memory functions are changeable reminder or wake-up messages which are automatically displayed when the unit is switched on; alpha scrolling; and memory linking for long touch tone sequences.

The Model 232 has a super-twist LCD display designed to be easily read from any angle, and includes continuous battery and signal strength indicators.

The phone also supports high-speed data/fax support via the soon-to-be-released Nokia PC card PCMCIA modem, which can send and receive data, faxes and e-mail over the public cellular network at speeds of up to 4,800bps. The Nokia 232 comes with a three year warranty, and is priced at $1,495.

Nokia Mobile Phones
(02) 368 1055

Nokia's Model 232 can weigh as little as 185 grams

NetWare LANalyser for Windows

Novell has announced the new LANalyser for Windows 2.1, which officials say is the first Windows-based network analysis tool for NetWare and UnixWare, Apple Macintosh, Unix and IBM networks. The product will also support 100Mbps Ethernet when it becomes available.

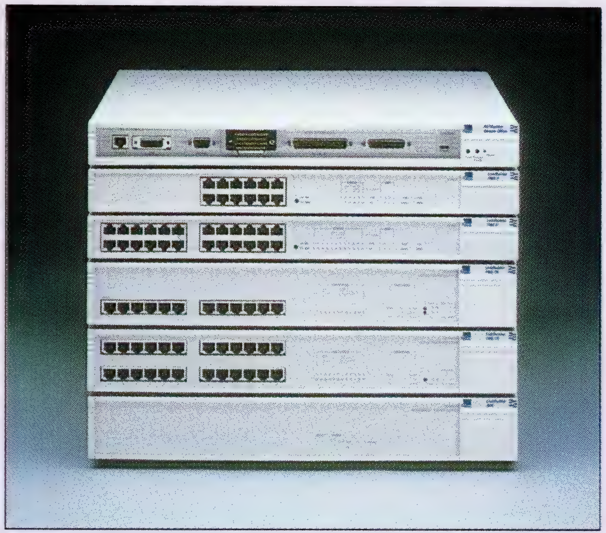
NetWare LANalyser for Windows is based on NetWare Distributed Management Services (NDMS) architecture, and provides a standalone tool for management of small networks. It has a look-and-feel that is consistent with NetWare LANalyser Agent, a NetWare Loadable Module that supports multiple segments and enables migration to larger environments.

Novell officials said the product is easy to use for novices, who only need to mouse-click through screens to display critical network information such as traffic rates, bandwidth utilisation and network errors. It can automatically discover and diagnose common networking problems and proactively recommend ways to rectify the problem, and additionally, can be loaded onto a portable computer to help troubleshoot and analyse activity on remote networks.

New features of the product include: NFS decode capabilities to help users troubleshoot problems with Unix workstations; SNA decode capabilities for troubleshooting IBM mainframes and AS/400 systems, networked applications running on IBM equipment, and front-end devices such as 3270 terminal emulators; and a wider choice of interface adaptor options.

The new NetWare LANalyser for Windows 2.1 is priced at $2,585, and users of version 2.0 can upgrade for $500.

Novell (02) 925 3000



The new SuperStack range lets users easily expand their network

3Com Releases Integrated SuperStack Family

3Com has announced the release of its new SuperStack family of products, which the company says is the first fault-tolerant integrated stackable system designed both for the workgroup and remote office environments.

The family allows users to integrate different networking products and technologies into stackable systems for Ethernet, Token Ring, FDDI and SNA, and will provide future support for high speed technologies such as Fast Ethernet and ATM.

Products in the SuperStack family include LinkBuilder hubs, bridges, NetBuilder routers, a LAN switch, SNMP management modules, an SDLC converter, and AccessBuilder dial-in remote access module for SuperStack.

3Com officials said a stackable networking environment offers users scalability and flexibility, allowing them to expand in response to need rather than having to spend money on unused ports and other equipment. Each SuperStack system can include up to eight Ethernet or 20 Token Ring logically managed hubs and other SuperStack devices, with one Redundant Power System per four hubs. A single hub stack supports up to 192 Ethernet or 256 Token Ring users.

The SuperStack system is managed via 3Com's Transcend Enterprise Manager or Transcend WorkGroup Manager.

3Com (02) 959 3020

Ethernet Print Server

Swedish firm Axis Communications has extended its range of Ethernet print servers to include a new 10Base-2 version, the NPS 532.

The product allows access to any printer on the network for computers running NetWare, LAN Manager or LAN Server, and protocol upgrades for TCP/IP and Apple EtherTalk are inexpensive and simple to install, said company officials. Users running NetWare and TCP/IP can buy a model which offers full support for all five protocols.

The new server incorporates Axis's own 32-bit RISC processor and can achieve throughput of up to 1,200Kbps. It has a set of eight fully programmable logical printers which allow automatic ASCII-to-PostScript conversion, string substitution and character set conversion. It also facilitates printing from a multi-host environment, and allows for the selection of multiple bins and form sizes and the running of different printer emulations.

The NPS 532 print server offers throughput of up to 1,200Kbps

IBM's new server, PC and ThinkPad ranges support multimedia

IBM Launches New Servers, ThinkPads and PCs

IBM has announced the launch of a swag of new network servers, PS/2s, PS/1s, ThinkPad notebooks and ValuePoint PCs.

The new EISA-based PC Server range is sold with a choice of Intel 486DX2-66 or Pentium 60 processors, and comes with a PCI bus, and Enhanced IDE PCI controller, and SCSI-2 Fast PCI adaptor. The servers have a 256K level 2 cache and support for up to 192MB of RAM using 72-pin SIMM modules. There are nine disk bays for both 3.5 and 5.25-inch floppies, a built-in IDE controller, and, using the Fast SCSI-2 PCI bus adaptors, both models are able to access up to 14GB of storage space. They have nine expansion slots, support up to four EISA and two PCI BusMaster adaptors, and are priced at between $5,215 and $11,238, including tax.

The new ThinkPad notebooks, the 755 Series and the entry level 360 Series, feature multimedia capabilities including a 'rocket chip' accelerator local bus video, built in microphone, larger disk drives and up to eight hours of battery life. The systems have pop-up keyboards to provide easy access to removable modular components.

The latest PS/2 76 and 77 desktop systems feature 486DX4 chips, 32-bit local bus graphics, up to 64MB of RAM, L2 cache, MicroChannel buses and power management, while new PS/1 'consumer' systems support CD-ROM and are multimedia-capable. The PS/1 series ranges from a 25MHz 486SX model to a 66MHz 486DX2 model, and all come with 4MB of RAM.

IBM 13 24 26

The Axis NPS 532 is available for $650, excluding tax.

Intelligent Technologies
(02) 891 6010

LAN/WAN/ATM Analyser

GN Navtel has announced the latest flagship product in its family of protocol analysers. The InterWatch 95000 is a rugged, portable unit that has been designed to handle ATM, but also supports WAN, Ethernet and Token Ring.

Based around a Unix system, the 95000 features a very high-speed VME-bus and RISC processors on all I/O modules and all Protocol Engine modules, and an X-Windows/Motif user-friendly interface.

It has a modular architecture with 8VME slots to provide for any combination of Input/Output and Protocol Engine modules, and provides distributed parallel processing capabilities to allow multiple RISC processors to share the workload in demanding ATM applications, said officials.

Users have the ability to see data on both the input and output of internetworking devices simultaneously, and the unit has common clock synchronisation on all modules to ensure proper data correlation. It can be controlled from remote locations, and multiple units can be controlled using one InterWatch analyser.

The 95000 also conforms to ASN 1 MIB standards, so when an RMON MIB agent is added multiple units can be controlled by standard SNMP management systems such as HP OpenView.

Due to ship in the final quarter, 1994, the initial release will provide multiport Ethernet and Token Ring LAN analysis and multiport ATM at the DS3 level. Later releases of the product will include 155Mbps OC-3c for Sonet and SDH, and other WAN and LAN ATM interfaces.

GN Elmi (03) 890 6677

New Olicom Drivers

Olicom has announced new versions of its PowerMach software drivers for its range of Token Ring adaptors, which the company says will provide performance improvements of up to 30% and also incorporate a full set of desktop management capabilities.

The new drivers work with all versions of Olicom 4 and 16Mbps Token Ring adaptors including ISA, EISA, MCA and PCMCIA and operate in a variety of environments including NetWare, IBM LAN Server, Windows NT, Windows for Workgroups and LAN Manager.

The design of the PowerMach drivers uses a parallel processing technique to address the three main factors that impact performance of Token Ring networks: maximised receive and transmit frame rates for both small and large frame sizes; low latency; and CPU and PC bus utilisation, according to company officials. They said the drivers' high performance also makes them well suited for use in router applications.

The desktop management capabilities of the new drivers include an SNMP desktop agent which can provide information about the workstation in which the drivers are installed and the network traffic flowing to and from it; and the ability to provide DMI-compliant information to network operating systems which support DMI. Users can display management information using the Olicom Adaptor Info for Windows utility which translates DMI data from the drivers into easily readable information on configuration, installation and performance.

Upgrades can be obtained free of charge by contacting the Olicom electronic bulletin board (+45 45 27 01 00), via CompuServe (type GO OLICOM after log-in), or by contacting Olicom distributor Force Technology.

Force Technology
(02) 971 1000

Software Usage Meter

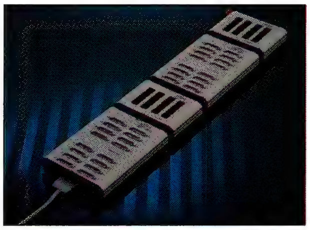
Megatec has announced the release of AppMeter from US vendor Funk Software, which provides network managers with a powerful tool for monitoring the use of applications on Novell networks running under DOS, Windows or OS/2.

Officials said the software is flexible enough to handle any kind of software usage policy a network administrator may want to impose, such as lock-out of additional users when a specified maximum is reached, or the granting of rights to applications by user name or by group.

AppMeter makes it easy for managers to honour constraints on the number of users per network licence agreement, and to monitor demand so that new applications can be bought when they are really needed, eliminating overbuying.

It logs all application usage and provides current and historical information which can be categorised by user, application or workstation. There is provision to create up to 11 different reports including daily bar charts

Olicom's new PowerMach drivers use parallel processing



EasyConnection supports DOS, Unix and NetWare environments

showing hour-to-hour usage. The software also has a virus-protection feature which checks applications each time they are run to ensure they have not been altered.

AppMeter runs on Novell NetWare 2.1X or 3.X or NetWare 386, and can be supplied as a NetWare Loadable Module. It is priced at $1,080 per server.
Megatec (03) 874 3633

Stallion Connectivity Solution

Australian developer, Stallion Technologies, has introduced a new version of its EasyConnection connectivity solution for DOS, NetWare and Unix.

The new EasyConnection 8/64 doubles the number of connections available under the previous version from 32 to 64, and the number of serial ports per system from 256 to 512. Also added is support for DOS and NetWare-based systems as well as most versions of Unix.

The system is modular, allowing users to start with as few as eight ports and add additional ports in eight- or sixteen-port increments. It provides continuous throughput performance of 38.4Kbps for 64 ports or 115Kbps for over 20 ports, yet consumes less than 1% of host CPU resources per port under Unix.

Stallion claims a number of firsts for the product, including the use of RS232D signalling that allows cable runs up to as much as four times longer than standard RS232 signalling; and the ability to drive serial ports at 145Kbps, faster than most serial devices currently support. Officials said this gives the unit a long life span and would allow it to work with faster technologies as they develop.

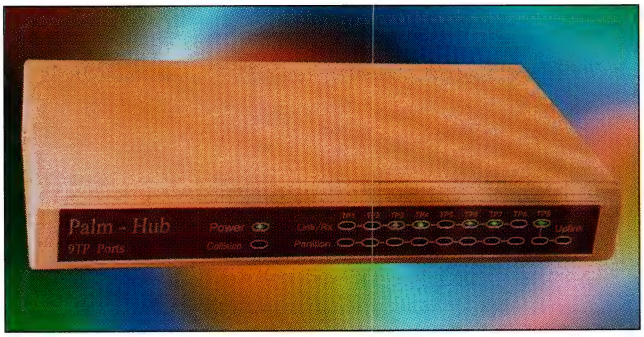
EasyConnection supports PPP and CSLIP, making it ideal for use in LAN-to-LAN connections using low-cost serial lines. Surge protection on every port optimises the unit's reliability. Options include RJ45 and DB25 connectors, RS-232-D or RS-422-A signalling, 8-port or 16-port modules, and host adaptors for ISA, EISA and Micro-Channel machines.
Stallion Technologies
(07) 870 4999

Palm Hub

Australian manufacturer Speedycom has released the new 9-port Palm Hub, a UTP hub which offers eight ports for normal star-configured connection to LAN components, plus an additional port which can be used to cascade to another hub, allowing for expansion of the network as required. The hub is small enough to fit on a desktop or be wall-mounted, and company officials said it represents a cost-effective alternative to 12-port units for smaller networks.

The hub has LED indicators for Power, Collision, Link/Rx, Partition and Uplink to aid the diagnosis of network faults. It also acts as a repeater, and can amplify signals over long distances to preserve data integrity.

The Palm Hub can cascade up to four units, and each unit can be connected to network sta-



Speedycom's Palm Hub is small enough to be placed on a desktop

LM1 PocketScope New Edition
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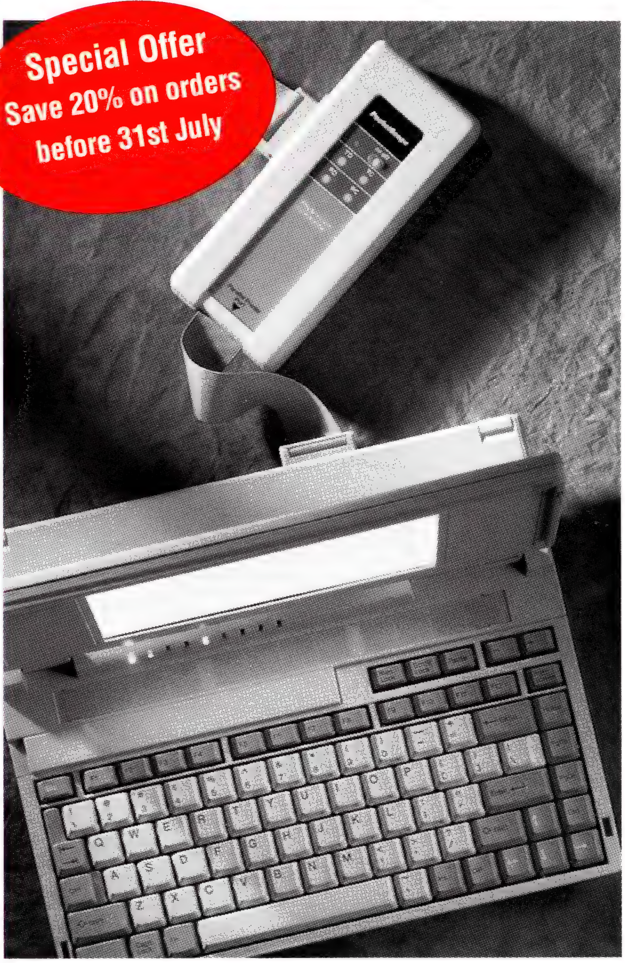

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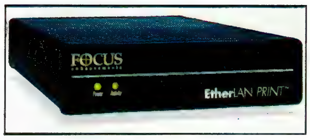
tions at distances of up to 100 metres. They are guaranteed for two years, and sell for $450.
Speedycom (09) 388 1766

Ethernet Print Server

Advanced Components and Peripherals has introduced EtherLAN Print, a new product that enables easy connection of LocalTalk LaserWriter printers to Ethernet networks.

Around the size of an average modem, the product is available in both two-printer and six-printer versions, and will work with any brand of LocalTalk compatible network printer or other LocalTalk device such as Macs or network modems. A BNC connector for 10Base-2 and an RJ-45 connector for 10-Base-T are both included to ensure cabling flexibility, said officials, adding that support for both cabling types typically has to be purchased separately in competing products.

Included with the EtherLAN Print is a security and software management utility to ensure access is restricted to authorised users only. Officials said the product is very competitively priced, selling for around one-third less than comparable products.
AC&P (03) 720 4344



EtherLAN Print connects LocalTalk printers to Ethernet networks

Fibre Optic Test Kits

Wandel and Goltermann has announced the release of two new fibre optic test kits. The OMK-8 and OMK-10 are powerful tools for measuring levels and attenuation on LAN and FDDI systems with multimode fibres.

The OMK-8 is designed for applications in the 850nm range, and includes the OLS-8 Optical LED Source and the OLP-10 Optical Power Meter. The OMK-10 contains the OLS-10 Optical LED Source (1300nm) and the OLP-10, and is suitable for testing 1300nm multimode systems such as FDDI.

Both instruments are capable of a dynamic range of more than 50dB when measuring attenuation. To identify fibres on the RX end, the output signal can be modulated at 270Hz, 1kHz or 2kHz, and the receiver recognises and displays the modulation frequency, significantly reducing the risk of confusing fibres, officials said. The generator and receiver can be operated for approximately 20 hours with normal batteries, or 10 hours with NiCad cells.

The instruments are housed in rugged hard shell cases, and the OMK-8 and OMK-10 also include one Wandel & Goltermann test adaptor each for the generator and receiver, four NiCad cells and an A/C adaptor/charger.
Wandel & Goltermann (03) 690 6700

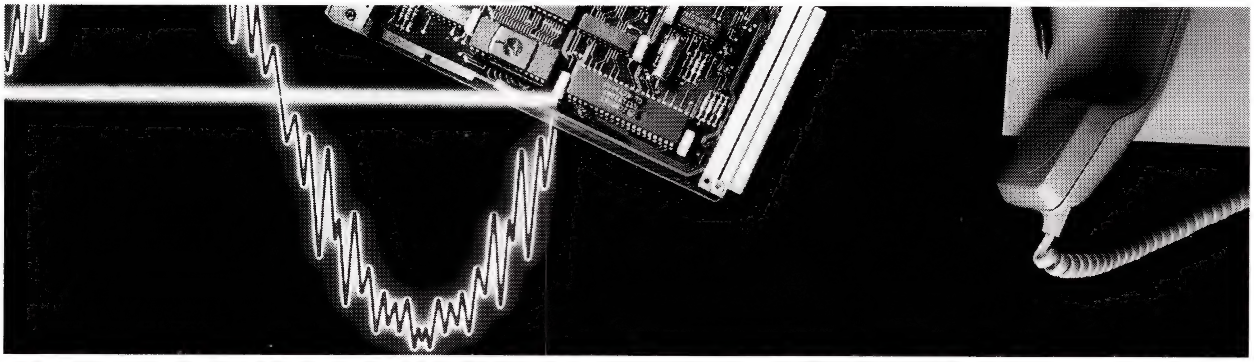
Wandel & Goltermann's OMK-8 is for use in the 850nm range

Small Ethernet Hubs

SynOptics has launched the new Lattis System 800 family of eight-port 10Base-T hubs which are specifically designed for use in remote offices and small workgroup environments which have a very low node count.

At $1,325, the Model 810M is the lowest priced SNMP-managed hub on the market, according to SynOptics officials. The

When the line stops here... so does business



The *new* Critec Subscriber Line Protectors, SLP, for operational reliability.

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CRC-8210 OZ

unmanaged Model 800 sells for $650, and both units offer a lifetime limited warranty which includes the power supply.

The Model 810M supports SNMP management over both IP and IPX network layer protocols for integration into both TCP/IP and NetWare IPX-based networks. It is managed by SynOptics' Lattis EZ-View application and Optivity network management system.

The Model 800 is a plug-and-play solution which needs no special set up. The new hubs can be connected together using straight-through UTP wiring — eliminating the need to purchase special cables, officials say.

SynOptics Communications (03) 853 0799

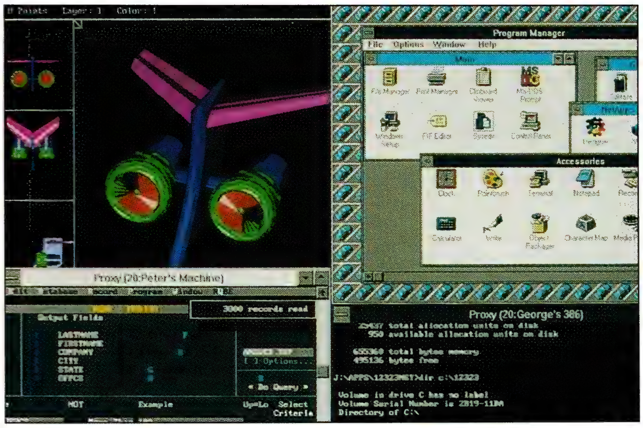
Net Remote Control

Megatec has released Proxy, a new package from Funk Software that allows Windows users to take over and control other PCs on a Novell network.

The software supports Windows-to-Windows and Windows-to-DOS capability. LAN managers and users can control one or more PCs simultaneously, while still permitting the user to continue to work in other Windows applications.

A spokesperson said the software is well suited to applications such as bulletin board management, technical and help-desk support, software updates and system configuration, lab testing, desktop multi-processing and remote job service.

As well as allowing network managers to centralise administration, the system lets users off-load CPU-intensive tasks to other machines while still being able to use their own computers. Help Desk staff in large corporate networks can also quickly determine users' problems without leaving their desks, and Proxy can also be used to monitor banks of 'userless' PCs that are functioning as communications servers, bulletin boards, batch processors and report generators, saving on the need for keyboards or monitors.



Proxy allows Windows users to control other PCs on the network

The product comprises two components, the Proxy Master and the Proxy Host, which communicate via an IPX network.

An add-on product, Proxy Server Host, functions as a NetWare Loadable Module and allows network administrators to take over and operate a Novell NetWare file server from a Windows workstation.

Megatec (03) 874 3633

ISDN Router

Datacraft claims to be the first local vendor to offer both Australian Basic Rate and Primary Rate ISDN connectivity in a router, with the incorporation of ISDN support into its locally developed and manufactured AP4000 OpenRouter family.

Basic Rate ISDN has now been incorporated into the AP-4600 OpenRouter and Open-

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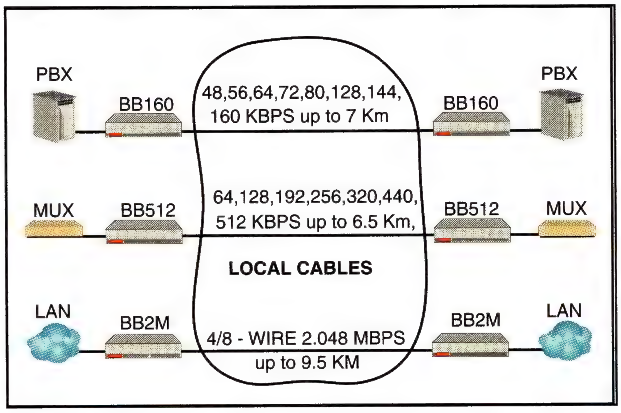

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NSW 2064. Fax: (02) 906 6327
Phone: Sydney. (02) 906 6335.

Micropolis's new IDE disk drives expand storage to 1.76GB

Router ELF products, which are designed particularly for remote access user requirements. Primary Rate ISDN has been incorporated into the company's AP-4100 and AP4700 OpenRouters, which are both medium-range multi-access products designed for central office applications. The enhancements are available in Datacraft's OpenRouter Release 4.6, and are available in update form for existing OpenRouter installations.

Other features of the new release include: AP4103 Processor Board with Token Ring; AP4660 OpenRouter with Token Ring; AP-4700 OpenRouter; AP4701-V.35/X.21 interface for AP4700; OpenRouter ELF-Token Ring capability; IPX routing; source routing and source route transparent bridging; and NCR-Isoasync legacy support.

Datacraft (03) 727 9111

New Disk Drives

Micropolis Corporation says its new generation IDE disk drives break the traditional IDE storage capacity barrier of 500MB, allowing users to expand their disk storage to 1.67GB or higher. This obviates the need to purchase an additional SCSI controller, officials say.

The new drives surpass the IDE 500MB limit by utilising specially developed configuration software, which not only increases storage but can improve disk performance dramatically, officials said, adding that the drives are fully compatible with the proposed Enhanced IDE Interface.

The 3.5-inch drives offer a mean-time-between-failure of 300,000 hours, and come with a five-year warranty.

Merisel (02) 882 8888

More DA-30 Protocols

Wandel & Goltermann recently announced three new protocol suites for the DA-30 Internetworking Analyser. The suites provide decodes for Novell's NCP suite, and for the LAPB and LAPD protocols.

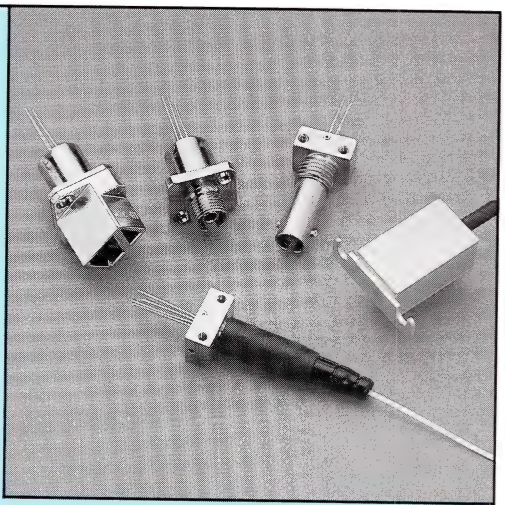
The NCP suite is a set of routines and primitives that operate at the Application Layer and make up the fundamental language that NetWare 'speaks.' It allows a client and server to converse using one of two network interfaces or message delivery systems, IPX and SPX.

The protocol decode provides summary traces of NCP traffic and gives users information about a range of different functional categories including: AppleTalk File Protocol (AFP), Accounting, Bindery, Connection, Extension Attribute, File System, File Server Environment, Message, Print, and Queue, together with Synchronisation and Transaction Tracking.

The LAPB (Link Access Procedure B Channel) and LAPD (Link Access Procedure D Channel) are both subsets of HDLC and operate within X.25 networks. LAPB is a single point-to-point line protocol specification that manages the data interchange between the Data Circuit Equipment (DCE) and Data Terminal Equipment (DTE).

LAPD can function both as a point-to-point or multi-point protocol with data interchange between a single peer entity and broadcaster for an entire group of entities. Both protocols can decode encapsulated Ethernet frames running on top of the WAN link, and can also provide protocol-specific summaries of all captured frames in Run or Examine modes. Frames can be viewed in Examine Mode for detailed analysis on the summary trace screen, while post-capture display filters let users further examine data by filtering on protocol and frame types.

Wandel & Goltermann (03) 690 6700



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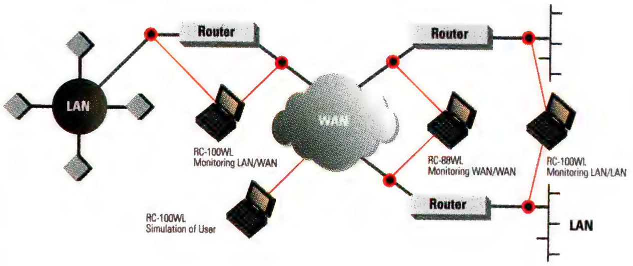

INTERFACES

Token Ring, Ethernet, V.24, RS422, V.35, X.21, E1 (G.703/G.704)

WAN PROTOCOLS

ASYN, SYNC, X.25, SNA/SDLC, Frame Relay, PPP, Encapsulated LAN Protocols

LAN PROTOCOLS

LLC, Mac, NetBeui, NetBios, SNA, IPX, NCP, TCP/IP, SNMP, VINES, Appletalk, DecNet, XNS, OSI, NFS, X-Windows

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The Acsys 10Base-T transceiver features easily readable LEDs

Low Cost Transceiver

Acsys Incorporated has announced a range of low cost compact transceivers for use in 10Base-T and fibre optic environments.

The 10Base-T transceiver supports an optional 50-metre AUI cable, full modular jack isolation, polarity detection and reversal, and complete SQE implementation as specified in the IEEE 802.3 standard.

The Acsys-FL Transceiver is fully 10Base-T compliant and connects easily to either a concentrator, workstation or bridge AUI port and features fibre optic link segment capability for up to four kilometres, according to officials from the company.

Both units have been designed so that LEDs are easily visible in both vertical and horizontal positions, and because of their small width the slide lock can be engaged without using any tools, officials said.

Acsys (02) 299 2799

ADC Unveils ATM

ADC Telecommunications has unveiled its new ATM strategy, which will encompasses a broad range of products from ADC Fibermux, ADC Kentrox, and ADC's Transmission Division.

The ATMosphere hub (an upgrade of the Crossbow Plus multi-LAN hub from ADC Fibermux) has the ability to consolidate voice, data and video signals in a single ATM backbone and LAN access point,

End-users who need LAN-WAN interconnection at high speeds can use the ADC Kentrox DataSmart E3 ATM Data Service Unit (ADSU) or E1 ADSU. These products are especially designed for users needing dedicated bandwidth for the transfer of large files like medical images or real-time graphics, and provide an economical link to ATM and SMDS networks, officials said. ADC Kentrox is also releasing the ATM Access Concentrator 1 (AAC-1), a modular cell multiplexer which can manage bandwidth and combine ATM, frame relay and isochronous lines onto a single E1 ATM network.

The ADC approach involves the installation of small ATM 'edge switches' which keep local traffic local and funnel diverse information streams into a single pipe, which eliminates the expense of backhauling with multiple overlay networks.

The ATM edge switches will be built around a multi-service platform that aggregates ATM, frame relay, SMDS, native LAN and isochronous service, and will be based on global standards, supporting SNMP with planned migration to the Common Management Information Protocol (CMIP) interface.

ADC Telecommunications (02) 975 1499

New RouterMan

SynOptics has released a new version of its RouterMan application which includes the ability to manage routers from Wellfleet.

The company claims the new product is now the first diagnostic tool for performing real-time monitoring and management of multiple vendors' routers and all leading Unix platforms including SunNet Manager, HP OpenView and NetView/6000.

RouterMan version 2.1 supports Wellfleet routers and enterprise MIBs, and can quickly determine the health of a router by the use of intelligent thresholds. Faults are easily identified via colour-coded alerts and SNMP traps, and log entries of network events supply information

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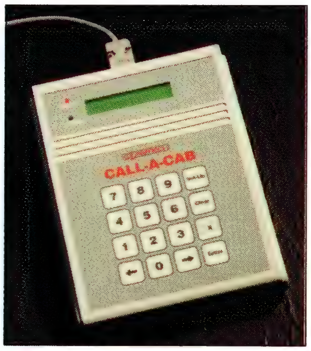


The GTalk terminal can be used for a range of custom applications

as to the source of problems and suggested remedial action.

RouterMan version 2.1 sells for $5,195, and upgrades from older versions can be obtained for $1,295.

SynOptics (03) 853 0799

Pocket Sized Display Terminal

Australian developer, General Technology, has developed a small flexible display terminal for controlling, monitoring and communicating with local or remote computer systems, which has the ability to respond verbally to user interaction.

The new GTalk product is designed around a powerful 8-bit microcontroller with up to 16K of PROM and 350 bytes of on-board RAM.

An in-built message recording and playback feature allows the unit to generate short and clear verbal prompts, sound effects or music, which can be used to confirm input or annunciate events. It can include a variety of peripheral devices to suit a customer's requirements, such as: speech record and replay (up to two minutes); local and remote touch memory reader; audible alarm and LED status indicators; LCD display; real-time clock/calendar; and RS232 serial port.

The GTalk also supports the Dallas touch memory devices via an optional KeyTag reader. KeyTags provide a unique, secure 48-bit serial number which can be read by the GTalk, and which can be used for applications in systems such as bundy clocks, access control and job progress monitoring.

General Technology
(02) 498 2066

Token Ring Print Server

Emulex has recently announced the availability of NETQue Token Ring, an addition to its existing family of external print servers that operates on Token Ring networks.

The product lets users working with TCP/IP, NetWare and TokenTalk protocols to simultaneously share any type of printer or plotter, and it supports Unix, NetWare, Apple and LAN Manager systems.

The NETQue TR has two ports, one bi-directional parallel port and one high-performance 115.2Kbps serial port. It is able to control two printers simultaneously, and it can be user-configured to support both 4Mbps and 16Mbps data transmission speeds.

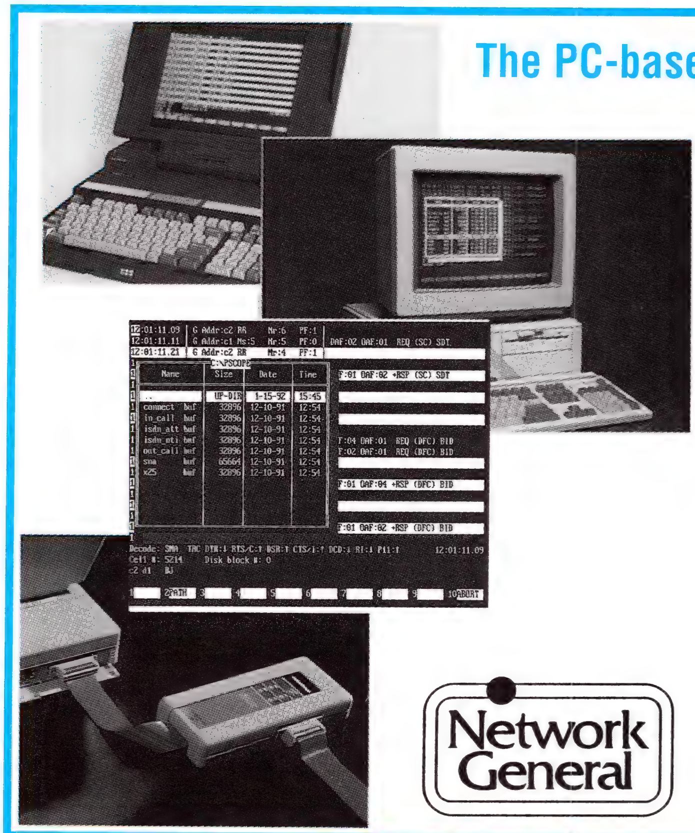
Emnet Technology
(02) 970 7722

New Cisco Interface

Cisco Systems has recently introduced a new interface processor which enables a single router to connect up to 240 remote locations. The MultiChannel Interface Processor (MIP) provides lower-cost, higher density remote access capability for multiprotocol routing, company officials said.

The MIP can configure up to 24 distinct channels within a single 1.544Mbps port, and it simultaneously supports routing for all network protocols as well as a range of WAN services including leased line, frame relay and X.25, with ISDN support planned for the future.

Officials said that by using the MIP, users can replace a configuration that once required 24 serial interfaces, 24 serial



The PC-based WAN protocol analyser family from Network General

LM2000
The all-in-one tool for todays and tomorrows networks, ASYNC to ISDN to FRAME RELAY from 50bps to 2Mbps.
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- Data monitoring, BERT(G.821), simulation , decodes and statistics
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LM1 Olympic Edition
Put the power of a dedicated 72Kbps analyser into a personal computer.
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- Full plain-English decodes for X.25/X.75, SNA, QLLC, Q.931, TRANSD, DDCMP and other
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LM1 PocketScope
Zero slot -The first PC-based protocol analyser for WAN testing that does not require an expansion slot. Ideal for portable or on-site desktop PCs.
- Notebook portability
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- G.821 BERT
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ISDN tel/scope
LM1 Olympic Edition with on board ISDN interfaces and software tailored for ISDN testing.
- ISDN 2B+D S/T interface
- WAN interfaces V.24, V.35, V.10/V.11
- B- or D-channel protocol support for ISDN BRI and PRI
- Voice and data monitoring in B-channel
- E1 pod for channel access on ISDN/PRI links

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Network General

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cables and 24 DSU/CSUs, with one channelised high-speed port and one CSU for a fraction of the cost. The Cisco 7000 can support a maximum density of 240 channels, while the Cisco 7010 can support a maximum of 144 channels.

Officials said future releases would include support for channelised E1 to enable connection to 2.048Mbps services and to an ISDN Primary Rate Interface.

Cisco (02) 957 4944

Scanner/Fax

Creative Pacific has announced the introduction of the ScanFX, a compact colour scanner which also acts as a plain paper fax and copier control unit. The product connects directly to a PC and works with existing peripherals connected to the PC or shared on a network.

Users can make high quality colour and black and white copies easily at speeds of up to six pages per minute, and 14 frequently used numbers can be programmed.

Full-page 24-bit scanning is performed at 1,200dpi, and the product comes with Picture Publisher 4.0 SE and Word Scan 2.0 software. The software provides users with the ability to scan images or documents and incorporate them directly into applications such as desktop publishing.

The unit has a 10-page document feeder and an auto-alignment facility for unattended operation. It conforms to leading industry standards, and is priced at $1,099.

Creative Pacific (02) 906 8887

APPC for Windows

DDP has recently introduced Attachmate Corporation's APPC for Windows, a package which has been designed to provide enhanced SNA support for distributed processing.

The new package fully supports both APPC CPI-C 2.0 interfaces to enable developers to quickly and easily build portable and open applications. Attachmate's software also supports APPN, allowing an APPC application to communicate across a wide range of diverse LANs and WANs.

The new product provides Windows users with the ability to directly access and manipulate data from a variety of disparate platforms including IBM mainframes, AS/400s, RS/6000, OS/2 and Windows NT servers and desktop systems, Digital VAXes and HP hosts.

APPC for Windows will be provided free of charge to all Attachmate Extra! for Windows 3.5 and 4.0 users.

DDP (03) 694 6711

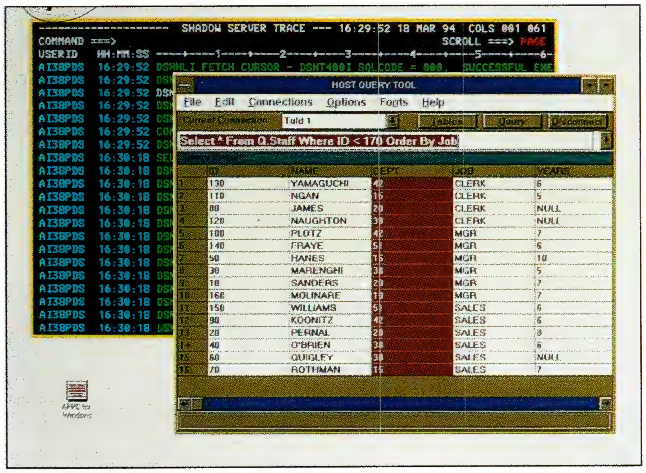
Rumba for PROFS

Rosser Communications has announced Rumba for PROFS 1.0 and Rumba for OfficeVision/VM 1.0. The products are graphical clients which allow users to access multiple mail systems, including PROFS and OfficeVision/VM, Microsoft Mail and cc:Mail, from a single common user interface.

The company has also announced a new VT340 graphics feature for Rumba for VAX and Rumba Office which allows Rumba VAX and Rumba Office users to simultaneously view and move data between character-based and VT340 graphics-based VAX/ VMS, Unix and PC applications.

Other features include on-screen remapping for ReGIS colours, and the ability to resize a window during a running display. A single user licence sells for $190.

Rosser Communications (02) 418 2544



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COMMAND ===>                                                  SCROLL ===> PAGE
USERID   HH:MM:SS ----+----1----+----2----+----3----+----4----+----5----+----6-
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AI38PDS  16:29:52 DS
AI38PDS  16:29:52 DSN
AI38PDS  16:29:52 DS
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AI38PDS  16:29:52 CO
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Select * From Q.Staff Where ID < 170 Order By Job

	ID	NAME	DEPT	JOB	YEARS
1	130	YAMAGUCHI	42	CLERK	6
2	110	NGAN	15	CLERK	5
3	80	JAMES	20	CLERK	NULL
4	120	NAUGHTON	38	CLERK	NULL
5	100	PLOTZ	42	MGR	7
6	140	FRAYE	51	MGR	6
7	50	HANES	15	MGR	10
8	30	MARENGHI	38	MGR	5
9	10	SANDERS	20	MGR	7
10	160	MOLINARE	10	MGR	7
11	150	WILLIAMS	51	SALES	6
12	90	KOONITZ	42	SALES	6
13	20	PERNAL	20	SALES	8
14	40	O'BRIEN	38	SALES	6
15	60	QUIGLEY	38	SALES	NULL
16	70	ROTHMAN	15	SALES	7

APPC for Windows lets PC users access data on mainframe systems

The EtherSwitch supports full-duplex Ethernet for greater throughput

EtherSwitch Boosts LAN Performance

Kalpana has released its first stackable Ethernet switching product, the 15-port EtherSwitch EPS-2015 RS, which the company says improves workgroup throughput while at the same time reducing connectivity costs.

The product supports existing 10Mbps Ethernet and also offers support for full-duplex Ethernet, effectively doubling the bandwidth of EtherSwitch-to-server and EtherSwitch-to-EtherSwitch links by allowing simultaneous two-way transmission.

The EtherSwitch EPS-2015 RS also offers several new features including virtual networking, address filtering, IEEE 802.1d Spanning Tree Protocol support, EtherChannel, and downloadable code.

The product has a latency of around 40 microseconds, which the company says adds up to significant performance improvements over store-and-forward devices. According to officials, a packet which needs to travel three 'hops' through three EtherSwitches will arrive at its destination in about 120 microseconds, compared with around 3,000 microseconds if it travels via store-and-forward devices. This low latency means EtherSwitches can be used in cascaded hierarchical networks without the risk of time outs or sluggish response, officials said. A stack of six EtherSwitches delivers 60 switched ports, up to 550Mbps throughput, and a transmission rate of 818,400 packets.

The product's full-duplex Ethernet technology allows it to establish two collision-free 10Mbps data paths on a standard UTP wire segment. Its EtherChannel feature is designed to eliminate bottlenecks between switches by providing multiple 20Mbps connections between two EtherSwitches. Users can configure from two to seven ports as full duplex EtherSwitch-to-EtherSwitch connections to improve response times between departmental and data centre EtherSwitches.

The Address Filtering feature allows managers to restrict specific nodes from communication with other nodes on a port-by-port basis, while the virtual EtherSwitch feature lets administrators partition one EtherSwitch EPS-2015 RS into multiple virtual LANs or domains for increased flexibility.

The EtherSwitch EPS-2015 RS comes in standard and enhanced versions. Both offer 15 switched 10Base-T ports, one user-selectable AUI port, and up to 6,000 addresses. The standard version, with SNMP and Spanning Tree Protocol support and downloadable code, is priced at $16,072. The enhanced version, which also includes full-duplex Ethernet, EtherChannel, address filtering and Virtual EtherSwitch, costs $18,326.

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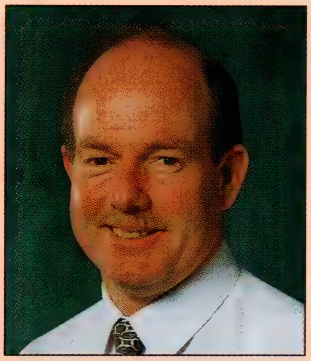

Editorial by Richard Allen

Revolution or Evolution?

In March this year one of the first tasks of the newly appointed Minister for Communications and the Arts was to announce that Telecom's Strategic Partnership Agreements (SPAs) and several Flexi-Plans contravened the 1991 *Telecommunications Act.* Telecom quickly responded by submitting to Austel a revised set of tariffs.

Shortly thereafter, in May, Minister Lee announced amendments to the Act. The thrust of these amendments was to give Austel significantly increased powers and a range of tasks designed to facilitate competition.

To what degree the above changes were prompted by legal action by Optus against Telecom on the grounds of anti-competitive behaviour, one can only speculate. However, around the same time Telecom was appealing against the limitations imposed on it (under the dominant carrier restriction in the *Telecommunications Act*) given that Optus has assumed a substantial share of the market in AMPS.

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The Change

With the backing of a strong ministerial directive and with a more consultative approach, Austel has now started showing its real mettle.

The first demonstration of this was when Austel agreed to allow Telecom MobileNet to be freed of the limitations associated with dominance, provided that it does not behave in an anti-competitive manner. Austel will be using a purpose-built framework to monitor this. As a result, MobileNet can now offer more innovative pricing.

Add to the mobiles approach the need for Telecom to develop new SPAs and Flexi-Plans and an Austel charged with the power and responsibility to force competition to occur, and we are on the threshold of a new stage of market development.

Irrespective of whether this is considered to be part of the evolutionary phase the industry will go through, or whether the power shift has created some revolutionary behaviour, the industry now has a chance to make substantial progress.

Where to From Here?

The consultative behaviour of Austel with industry participants ensures that Telecom has the opportunity to take a great leap forward by offering innovative and consequently more competitive products and services.

Let's look at what could be offered. Using mobile tariffs as an example, Telecom could supply Fastpac or B-ISDN on a reduced access tariff to those users who will commit to substantial usage. For those who wish to have the service available but only commit to low usage, the availability price becomes higher.

Some practical examples might be a firm of solicitors wishing to use videoconferencing on behalf of clients from time to time. The solicitors would invoice the client for the fees as they do for couriers or photocopying; usage goes up as people become accustomed to the business tool, and costs come down. Consumption depends on benefit derived, not only from ability to pay.

Other examples of use derived from lowered access fees could be 2Mbps access for engineers accessing plans from local councils, lawyers enquiring on land titles, specialists accessing patients' scans or running analysis over video links. Police and emergency groups could make use of graphic or image transfers where use is made in times of disaster and billed as part of insurance claims rather than as an annual cost to the department.

How much more beneficial the above applications are for society than 50 channels of repeat run or second rate movies!

Making it Happen

Pay TV will be delivered whether we want it or not. Innovative pricing for business applications, however, requires some lateral thinking and a customer focus from the carriers. To date we haven't seen much in the way of innovative products or pricing from Telecom or Optus. The innovative products we have seen have been let down by lacklustre pricing. From a revenue viewpoint, carriers will soon learn that the more access becomes affordable, the more customers will find ways to use the technology resource.

Maybe the recent changes will create the environment for innovation to occur. If not, it is up to us, as customers, to continue to push for it.

Richard Allen

Richard Allen
Deputy Executive Director

Good News! . . . For Basic Carriage Service Subscribers

BCS Now On-line

In order to distribute timely information on the changes to Telecom's Basic Carriage Service (BCS) tariffs, Telecom is setting up a fax notification service and a multi-line dial-up bulletin board.

When a Basic Carriage Service tariff change comes into effect, customers will be given an outline of the revised tariff by fax. If you require more detailed information, then you are able to download the latest BCS files from the Telecom bulletin board.

With this service, you will have access to full details of Telecom's latest filed Tariffs, Terms and Conditions for BCS.

Modem Standards

Telecom lines will allow connection to popular modems with V.32*bis*, V.32, V.22*bis*, V.23 and V.21 standards. Note that normal telephone charges will of course apply.

The BCS Tariff files will be in Word for Windows format in a Zip file. The files, when extracted, can be accessed and read as text files on most popular word processing packages.

Telecom will include with this information, your details as they appear on their database.

Whilst on the service, please take the time to make any changes necessary, including your phone and fax details, so that Telecom can register you on their bulletin board and issue you with your password. You may access the tariff bulletin board as soon as you receive your password.

ATUG strongly endorses such an activity. Our only criticism is, when will Telecom stop referring to and treating customers as 'subscribers'?

Broadband Services

It's time to put on our thinking caps!

Amidst all the hype associated with the information superhighway, the main focus seems to be on Pay TV.

Some ideas have been forthcoming from academia regarding connecting campuses together, while other users of broadband have been driven by the need to reduce costs but improve services, particularly in the area of recording and analysis of medical images.

What must be done is for us, as users, to identify what we would like to achieve with access to large slices of bandwidth. The ideas developed should not be constrained by the existing tariffing regime. Telecom is becoming increasingly aware that users are more than subscribers. In fact, Telecom employees are starting to talk about customers, customer needs and customer perceptions, rather than the 'market' or 'business users' and 'residential users'!

ATUG's Extra Service

Members may be able to reduce their telecommunications costs by up to 30% following the introduction of a new savings scheme by ATUG, the 'ATUG Extra Corporate Discount Plan.' Under this scheme, ATUG is able to provide discounts on telecommunications services and other corporate services.

Examples of the savings which users may be able to achieve via this scheme are:

⇒ For a one-person professional office, with combined phone, fax and mobile costs of about $200 each month, the savings under the ATUG Extra plan would be in excess of $600 per annum;

⇒ For a 13-person industry association, with combined phone, fax and mobile costs of $1,300 per month, the savings would be approximately $3,200 per annum;

⇒ For a small business with 20 personnel, and monthly telecommunications costs of around $2,800, the savings would be around $7,500 per annum;

⇒ For a 200-staff subsidiary of an overseas multinational, with a monthly bill of around $14,000, annual savings can be achieved in the order of $27,000.

As well as reduced telecommunications costs, the scheme also provides discounts on office equipment, travel, wine and insurance. The savings under the ATUG Extra plan are in addition to existing ATUG membership benefits like discount rates to the ATUG convention and ATUG seminars.

Interception & Recording?

Want to find out more about call interception and recording? Or any other topic in the Telecommunications Broadcasting or Radiocommunications legislation? Then you need the EIS Electronic Law Book on disk. The new EIS Electronic Law Book has been released and now includes all the updates to the Telecommunications legislation along with Broadcasting and Radiocommunications legislation. The publication, on a floppy disk, is available to ATUG members at the special price of $150 including — a saving of $50. A subscription including a further two updates is also available to members for $295 — a saving of $100.

To ensure that you have the legislation at your fingertips at all times contact the ATUG secretariat for details of how to order. Telephone (02) 957 1333.

AUSTRALIAN TELECOMMUNICATIONS USERS GROUP

ATUG Interoperability Network — A Huge Success

ATUG'94 was one of the industry's most successful exhibitions ever. A large contributor to this was the ATUG Interoperability Network. It allowed exhibitors to demonstrate the interoperability of their equipment as it was used as part of the network.

Of particular interest was the implementation of OSPF (Open Shortest Path First) around the backbone FDDI (Fibre Distributed Data Interface) between 3Com, Proteon and Wellfleet, which functioned perfectly.

The FDDI sandpit provided the only moments of panic with some equipment causing the sandpit to topple over on occasions — but that's what it was there for.

The frame relay network provided resilient connectivity across the whole exhibition and worked solidly.

The logistics of the network, such as address assignment, and port assignment, worked well with few vendors wanting connection missing out. Tight security was set up on all manageable devices in the network and no 'hacking' was discovered.

The only invalid operation that occurred was a vendor who took it upon themselves to assign their own host address; as it turned out it did not conflict with any other addresses, but they were instantly detected by the network operations centre and cautioned.

Direct Internet Access

Direct Internet access was provided throughout the show and several services were used. Some users found the Multi User Dungeons (MUD) hosts very interesting. MUDs are games which support several concurrent users. Players may interact as normal though in a virtual environment, and manipulate objects and each other — all through a text-based interface.

An Austpac gateway was also available and users accessed Keylink and other services. Some vendors were able to demonstrate services that permitted Internet access via Austpac.

Next Year: Bigger and Better

Next year, it is intended to base the network on an ATM backbone to provide broadband clear channel access with feeds for several technologies including: FDDI, Token Ring, Ethernet, Frame Relay, emerging technologies and fast Ethernet (Ethernet at 100Mbps). It is also hoped to extend the services available on the network to include an Internet mail server, better Internet navigation tools (such as Mosaic) for access to multimedia, and X.500 directory services. It is further hoped that demonstrations of network multimedia will be more widely implemented.

A large vote of thanks for the success of the network goes to JNA who were the architects of the network, and will be again in 1995. Already interest and support for the next ATUG Interop. Network has been coming in; it can only be bigger and better.

Changes at ATUG

Justin Cooke, our Technical Executive Officer, is leaving for a period of secondment and industry training with AAP Information Services.

Replacing Justin at ATUG will be John Pack. John comes to us with a wealth of experience in telecommunications. He has held several senior technical management positions related to telephone exchanges, CPE and network maintenance and the provisioning of telecommunications buildings.

In the five years prior to his retirement from Telecom, John was National Account Executive, Corporate and Government, responsible for the media portfolio. His customers included News Limited, AAP, ACP and John Fairfax & Sons.

John's outside interests include Rotary and golf, and he is the Deputy Chairman of the Royal Far West Children's Health Scheme.

Moving on . . .

Toula Mantis, the editor of ATUG *Newsbrief* and an important contributor to all of ATUG's promotional activities, has joined the ABC to work on a television program called *Hot Chips*.

Toula will be sorely missed at ATUG. We wish her well in her new career and thank her for a job well done.

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⇒ One year's free subscription to *Australian Communications*;
⇒ Discount rates to the telecommunications event of the year, ATUG's annual four-day conference and exhibition, ATUG '95;
⇒ Discount rates to ATUG seminars and workshops;
⇒ Free admittance to ATUG special member meetings;
⇒ Free assistance on matters concerning telecommunications;
⇒ Representations of your views to Austel and the Government;
⇒ A forum to exchange ideas with your peers in the industry;
⇒ A telecommunications library service;
⇒ Member rates for ATUG products and services;
⇒ Expert legal advice from ATUG's Legal Line service; and
⇒ An overall saving on your next communications bill due to ATUG's lobbying activities.

If you have any queries about your ATUG membership, call ATUG's national business manager, Owen Richards, on (03) 690 6395. Members in Queensland may contact ATUG's business manager, Jane Prentice, on (07) 870 8831. Members in Western Australia may contact ATUG's WA business manager, Geoff Groves, on (09) 450 3485.

ATUG Network Management Survey

Copies of the report of ATUG's Network Management Survey are still available — but not for too long! The complete report, including quantitative data, runs to over 40 pages together with well over 60 pages of supporting information and suppliers' responses. The report is available at $125 (including postage and handling) to ATUG members; and at $200 to non-members. For copies of either the complete report or the Executive Summary, please complete the form below:

Please forward ______ (qty) copies of the ATUG Network Management Survey at $125 for each copy ($200 non-members) for which I enclose payment of: $______

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Growing Interest in Frame Relay Technology

The 2nd Annual General Meeting of the Frame Relay Forum took place at the Sydney Opera House on 15th April 1994. It was attended by more than 90 participants, which was a good indication of the growing interest in frame relay technology as well as its acceptance by users, vendors and service providers.

Mr Peter Bax of Scitec Communications opened the meeting with an introduction to frame relay.

The Chairperson, Ms Linda Clarke, announced the new fee structure — local vendors and service providers can join the Forum for $1,200 per annum and local users pay $500 per annum. A special category introduced this year is the individual membership for $250 per annum.

Membership of the Forum provides full access to documentation both technical and commercial as well as the opportunity to participate and present details of products and services at all meetings organised by the Forum. For a small price, members can also access all details on the pioneering work that the Frame Relay Forum is pursuing around the world.

Ms Clarke stressed the focus of the Forum for the coming year would include a specific push to actively participate in the Technical Committee activities of the Forum on a worldwide basis, and the local chapter will take a strong interest in the Frame Relay SVC implementation. With the introduction of both domestic and international public frame relay services in Australia and New Zealand, the Frame Relay Forum provides an extremely useful venue for vendors, service providers and users to interact and exchange views on developing the technology further in the local marketplace.

This year, every meeting will have a separate vendor corner which will allow local vendors to release details of their products. Also, service providers will be allocated a separate slot in each meeting to discuss their services. It is planned to use videoconference facilities wherever possible to allow remote groups to participate in such meetings.

Various case study presentations were delivered at the AGM by vendors, service providers and users. The highlight of the meeting was a presentation by Mr Heikki Makiyarvi of Nokia Telecommunications, Finland, who talked about the work Nokia has done in the area of Frame Relay and ATM and enlightened the audience on the benefits of frame relay.

An important change from the usual vendor/service provider routine was the interesting presentation from Mr Divico Scheideggar of George Weston Foods Australia. Mr Scheideggar gave a user perspective of frame relay and the acceptance of the technology in the company's network implementation.

For further information on membership of the Frame Relay Forum, contact the Forum secretariat on (02) 975 2582.

ATUG in South Australia

ATUG members in South Australia should take advantage of the guest speaker presentations organised on a monthly basis by the South Australian Committee. The meetings are held on the third Friday of each month from 4:30pm to 6:00pm. For further information, contact ATUG State Secretary, Peter Hamilton, on (08) 344 6743.

ATUG Legal Line Service

Members should take advantage of ATUG's Legal Line Service. The service is run by ATUG director and chairman of ATUG's Legal sub-committee, Gerald Wakefield.

Members with legal queries regarding international telecommunications law and regulatory policy; radiocommunications; broadcasting and satellite law and policy; computer technology law; and intellectual property law are advised to seek this communications legal advice service by calling ATUG on (02) 957 1333.

Telecommunications Act on Disk

The new EIS Electronic Law Book now includes all the updates to the Telecommunications legislation along with Broadcasting and Radiocommunications legislation.

The publication, on a floppy disk, is available to ATUG members at the special price of $150 including postage and packaging — a saving of $50. A subscription including a further two updates is also available for the special price of $295 — a saving of $100.

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July

20-22 **Government IT Purchasing Reform/EDI in the Public Sector**, Lakeside Hotel, Canberra. With the Government's IT purchasing policy currently under review, and with electronic commerce targeted as a major policy objective in the '90s, this conference is for anyone in the public sector involved in the recommending or purchasing of IT equipment. The programme will address: the implications of the Systems Integration Panel review; new directions for GOSIP and Open Systems; methods to increase government purchasing efficiency; and electronic commerce initiatives for purchasing and procurement. The EDI component of the event covers ways to fund, and implement EDI systems. There will also be an implementation workshop on Day 3. Fee: three days $1,895; any two days $1,395; single day only $795. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

25-26 **Intelligent Networks**, Hyatt Kingsgate, Sydney. The growth in Intelligent Network services in Australia is just beginning to take off, with suppliers of switching, computer equipment and software predicting a boom in demand. This event explores opportunities using IN solutions, new network architecture standards, and also features overseas case studies. Fee: $1,395. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

25-27 **Remote LAN Access**, Sydney Hilton. This conference will give delegates an overview of new remote LAN access technologies to help them better define networking strategies and optimise their network. Emerging trends such as client/server computing will be examined, and the programme also looks at how to maintain a secure environment while still permitting essential remote links. A separately bookable one-day workshop focuses specifically on implementation issues. Fee: Two-day conference $1,395; workshop only $895; conference and workshop $1,995. Enquiries — AIC Conferences Tel: (02) 210 5777 Fax: (02) 221 7773.

27-28 **Electromagnetic Compliance and Interference**, Golden Gate Park Plaza, Sydney. In 1996 the European Union will introduce a newElectromagnetic Compliance standard which will affect all manufacturers of goods and components which are susceptible to electromagnetic emittance or interference. This conference will update delegates on the latest state-of-play, including how EU standards are being implemented, the impact on exports, the Spectrum Management Agency's testing requirements, and litigation issues. Fee: $1,095. Enquiries — IBC Conferences Tel: (02) 319 3755 Fax: (02) 699 3901.

27-28 **IT Performance Indicators and Benchmarking**, Sebel Townhouse, Sydney. This forum is designed for IT managers to develop performance criteria and benchmarking to evaluate cost performance, quality, best practice and strategic advantage in the purchase and implementation of IT equipment, and features seven detailed case studies from leading Australian corporates and government organisations. Fee: $1,395. Enquiries — AIC Conferences Tel: (02) 210 5777 Fax: (02) 221 7773.

27-29 **Multimedia '94**, Hotel Nikko, Sydney. This event gives a broad overview of multimedia, and what can be expected from the imminent boom in new applications which take advantage of the ability to incorporate sound, video, graphics and text. Fee: three days $1,895; two days $1,395. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

August

2-4 **Comtec '94**, Adelaide Exhibition Hall and Convention Centre, Adelaide. This conference and exhibition is expected to attract over 15,000 people, and will feature exhibitions by leading vendors such as Novell, Microsoft, Apple and Intel. Enquiries — Tel: (08) 364 4723.

3-6 **TUANZ '94**, Ellerslie Function Centre, Auckland. TUANZ'94, the annual conference and exhibition of the Telecommunications Users Association of New Zealand will have the theme 'Convergence in Action,' and will focus this year on the convergence of computing and telecommunications. For the first time the conference will include separate streams focusing on fields of interest, and there will be a seminar on Technology in Education. Enquiries — TUANZ Tel: +64 9 488 1602 Fax: +64 9 489 9515.

4-5 **Telecommunications Strategic Planning '94**, Renaissance Hotel, Sydney. This practical two-day workshop aims to provide delegates with the expertise needed to develop strategic plans for their telecommunications networks. It will offer a step-by-step approach to identifying and implementing corporate network requirements. Fee: $1,295. Enquiries — AIC Training Tel: (02) 210 5700 Fax: (02) 221 7773.

16-17 **GSM — Profiting from Digital Mobile Communications**, The Hyatt Kingsgate, Sydney. This conference will update delegates on the latest state-of-play and technical developments in GSM implementation. Speakers will look at the Government's planned phase-out of the AMPs network, the latest information on EMI/EMC interference, how to market, distribute GSM handsets and boost subscriber numbers, and ways to take advantage of new opportunities in value added services. Fee: $1,395. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

24-25 **Service Delivery Over the Last Mile of the Information Superhighway**, Ritz Carlton Double Bay, Sydney. This event focuses on the local loop in the information superhighway. Speakers will summarise the competing technologies, discuss government initiatives in the US and Europe, and give and international perspective on policy developments. There will also be a special Interim Report from Australia's Broadband Services Group and an update on the work of the Copyright Convergence Group. Fee: $1,395. Enquiries — IBC Conferences Tel: (02) 319 3755 Fax: (02) 699 3901.

September

25-28 **LETA 94**, Adelaide Convention Centre, Adelaide. This conference, Learning Environment Technology Australia, will explore, explain and demonstrate the effects of new and forthcoming technologies on learning and the way it is undertaken. As well as teaching issues there will be a focus on building design and adaptation to meet new requirements. The event features a wide range of speakers from both Australia and overseas. Enquiries — Tel: (08) 226 1266 Fax: (08) 226 1583.

26-27 **Communications Research Forum 1994**, Hyatt Kingsgate, Sydney. This event, targeted at the research community, looks at current and recent developments relevant to emerging public policy issues in the communications arena. The focus of the two-day conference will be on telecommunications, broadcasting and the radio spectrum, looking specifically at policy-relevant work into economic, sociological, cultural and legal implications. Enquiries — Vickie Richardson Tel: (06) 274 6846 Fax: (06) 274 6816.

October

25-28 **Communications India**, Pragati Maidan, New Delhi. This trade show will display a full range of telecommunications hardware and software in the areas of voice, data, visual display and radio. An associated technical conference will excover cellular mobile, networking and rural telephony. Enquiries — Exhibitions India Tel: +91 11 462 2710 Fax: +91 11 463 3506.

25-27 **Microwaves '94**, Wembly Conference & Exhibition Centre, London. This conference promises to bring together the largest gathering in Europe of microwave experts engaged in research and development for both telecommunications and civil and military systems. The program will cover the entire microwave and millimetre wave spectrum, with supporting RF and software technologies. Enquiries — Nexus Business Communications Tel: +44 322 660 070 Fax: +44 322 667 633.

December

5-7 **ATNAC '94**, Hilton Hotel, Melbourne. This event incorporates the Multimedia Communications, Applications and Technology Workshop, the Australia Broadband Switching & Services Symposium, and the Australian Teletraffic Research Seminar. The theme of the conference will be 'Meeting User Needs,' and keynote speakers include Phillip Dodds, President of the Interactive Multimedia Association of the US and Leonardo Chiariglione, convenor of MPEG. The registration fee for the three-day conference is $450. Enquiries — Margaret Keegel Tel: (03) 903 2808 Fax: (03) 903 2805.

January 1995

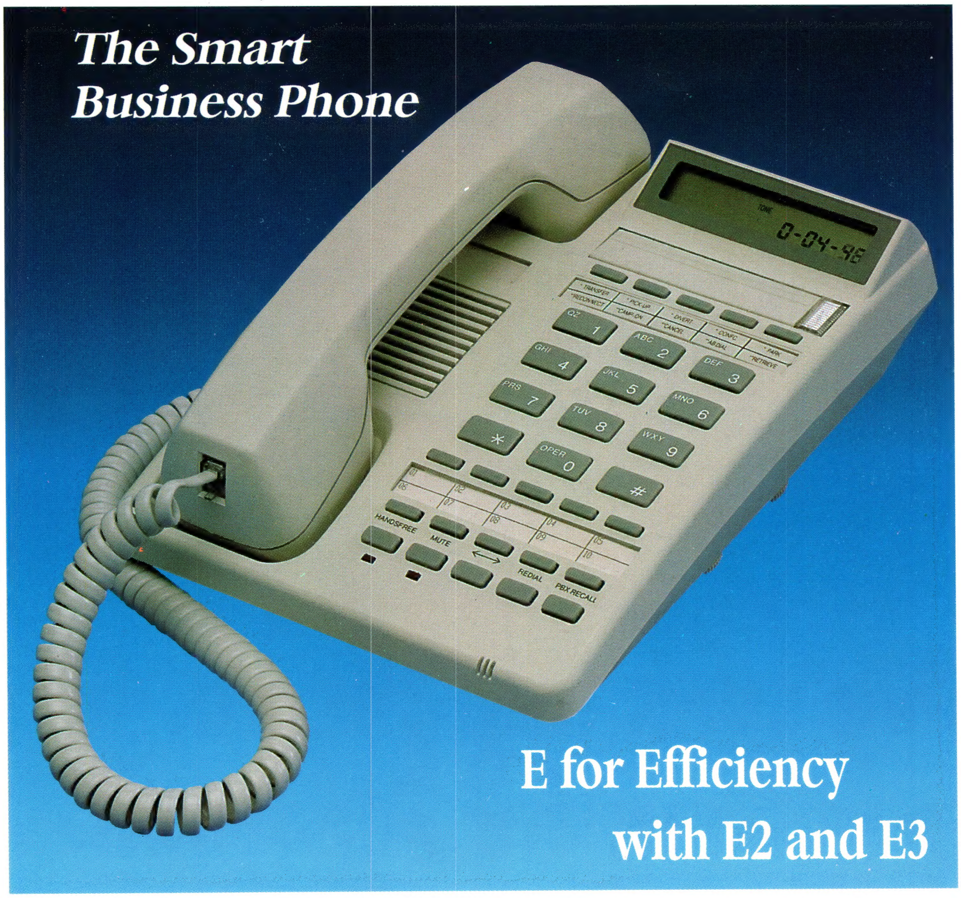
22-26 **PTC'95**,Sheraton Waikiki Hotel, Honolulu. The 17th Annual Pacific Telecommunications Conference has the theme of 'Convergence — Closing the Gap,' and will explore the convergence of technologies and the change this is bringing about in organisations, countries and industry sectors. Fee: Discounts apply for registration before July 31. Enquiries — PTC Tel: +1 808 941 3789 Fax: +1 808 944 4874.

February 1995

20-23 **InterComm 95**, Exhibition Centre, Vancouver. This year's conference has the umbrella theme 'Global Communications in the 21st Century.' Special topics under discussion include advances in wireless technology, global and corporate information networks, cabling issues for voice, data and image, and the carriers and new competition for the telecommunications infrastructure. A large trade exhibition will accompany the conference. Enquiries — Tel: +1 604 669 1090 Fax: +1 604 682 5703.

April 1995

15-18 **Midcom '95**, Abu Dhabi International Exhibition Centre, United Arab Emirates. Midcom '95 will be the largest and most comprehensive exhibition of communications equipment and services ever staged in the Middle East region. A conference on communications issues will accompany the exhibition. Enquiries — James McGee, Infocentre International, Dubai Tel: +971 4 310 551 or US agent Chuck Heath Tel: +1 215 751 9750.



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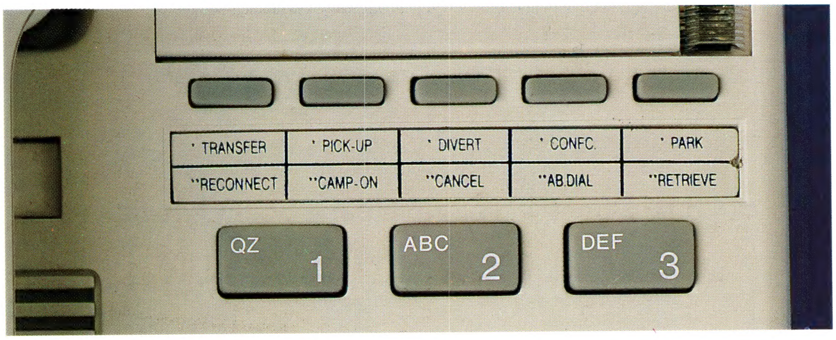
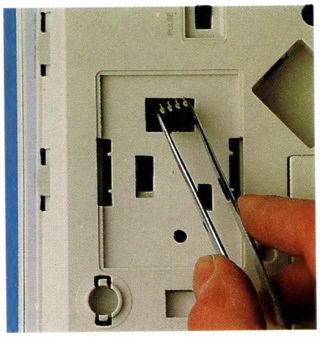


These phones not only look good, they will help you through the business day.

Easy to identify, easy to use PABX or carrier network facilities.



We fit this optional, specially masked Eeprom, permanently pre- programmed with your PABX or carrier network facilities

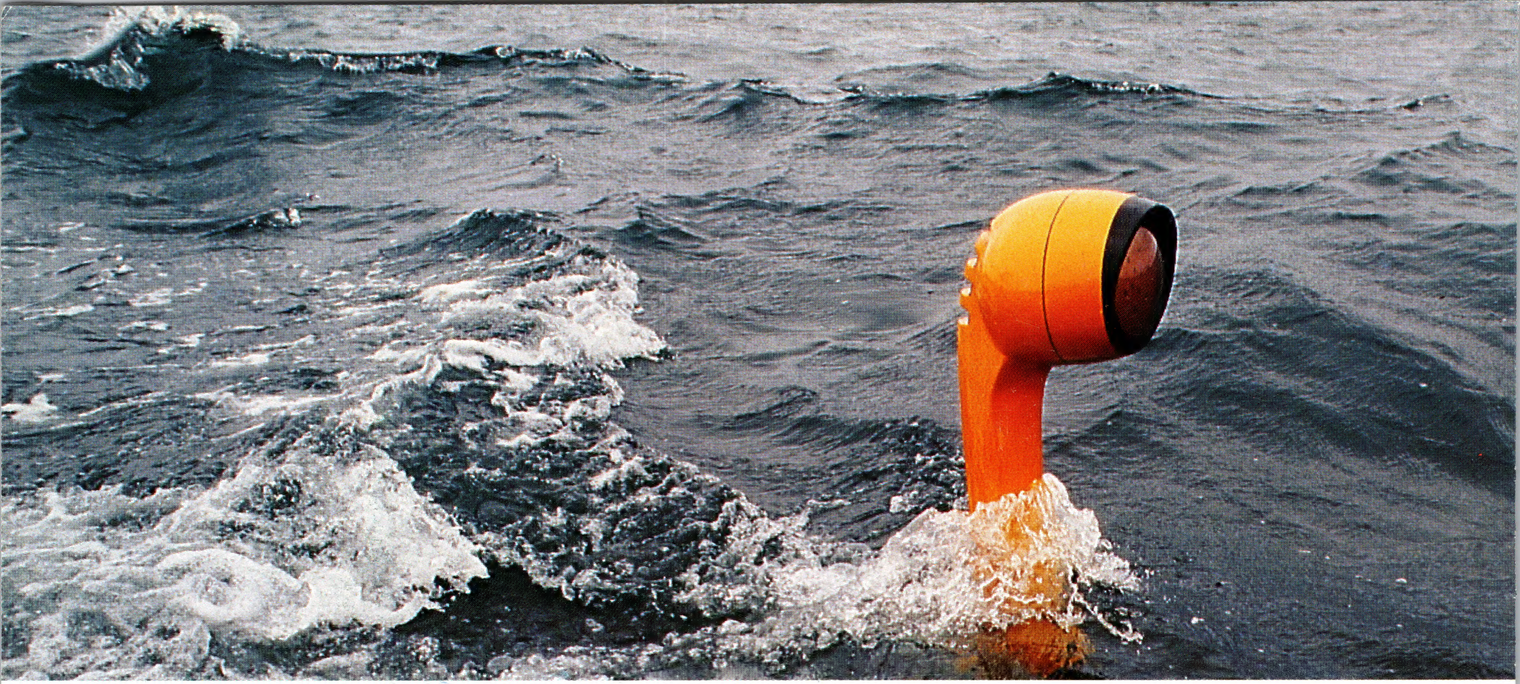
Maybe it is just checking the time or a telephone number being dialled from the display, talking handsfree or dialling on hook, phoning a colleague with one key touch or instructing the PABX or carrier network facilities to "call forward" your calls by one touch of a memory key. Whatever your job is, you will find E2 or E3 a very dependable workmate.

E2 and E3 can be purchased with customised pre-programming of PABX or network services such as Centel/Customnet/Centrex facilities as illustrated on the left of this page. The pre-programming is on a permanent basis, and will result in all staff being able to easily identify and use the PABX or Carrier facilities. The training time of staff in telephone feature use can be greatly reduced or even eliminated with E2 and E3.

E2 and E3 are not only business phones, they are ideal for home use when purchased with Telecom's "Easy Call" facilities pre-programmed into Eeprom memory for one touch activation.

IQ INTERQUARTZ® – The Manufacturers and Distributors

INTERQUARTZ (A'ASIA) PTY. LTD
Melbourne Phone: (03) 457 5000 Fax: (03) 458 4049
Sydney Phone: (02) 875 4011 Fax: (02) 875 4146
Brisbane Phone: (07) 808 8008 Fax: (07) 808 8080



What we've sunk into the Pacific is earning millions for Australia.

Alcatel is helping to ring the South Pacific with thousands of kilometres of optical fibre submarine cable. Most recently these cable systems were laid on the seabed linking Australia with the USA and Europe.

Another cable stretching from Australia to Guam will complete the South Pacific network. Some 16,500 km in all, it's helping Australia get better connected with the rest of the world. These cable systems carry up to 100,000 telephone calls simultaneously. And because Alcatel is making more and more for world markets, it signals not just a new era in communications, but also a multi-million dollar boost for Australia's economy.

So while you can't exactly see the work we're doing, the benefits are sure to surface.

Alcatel Australia. We're Australia's largest communications company because we know how to compete worldwide.

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